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1989

WEAPON SYSTEMS

UNITED STATES ARMY

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DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
WASHINGTON, D.C. 20310

January 15, 1989

To the Reader:

The Army has made great strides in its equipment posture in this decade. Many of the systems shown in this handbook such as the Abrams tank and Bradley Fighting Vehicle started production in the early 1980s, have been fielded in sizeable numbers, and are now undergoing product improvement programs to keep them responsive to an evolving threat. Our nation's warfighting capability has been significantly enhanced by a host of such major systems that have been introduced into the force across all mission areas.

Other systems portrayed are at an earlier stage in the Research, Development and Acquisition cycle. Modernization is a continuous process. Achieving qualitatively superior equipment is crucial in offsetting the numerical superiority of Soviet forces, and allowing our soldiers to meet any challenge worldwide. In the Research and Development section, which leads off this handbook, we describe how the Army is focusing, in a cost effective manner, on those emerging technologies which show the greatest potential for enhancing our future warfighting capability.

Following the Research and Development section, the weapons systems and other equipment shown are categorized by specific Army mission areas as follows: Close Combat; Air Defense; Fire Support; Combat Support; Combat Service Support; Command, Control and Communications; Soldier Support; and Strategic Defense.

We hope this handbook depicts our efforts to maintain a well trained, well equipped force, capable of fulfilling its role as America's strategic land force, as well as reflect the pride we take in our entire Army.

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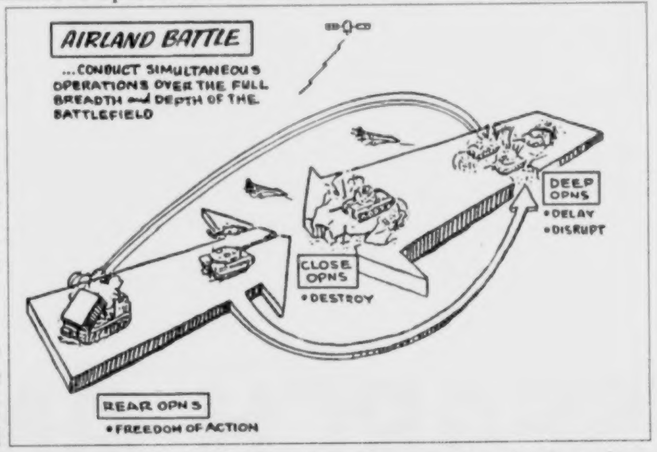
RESEARCH AND DEVELOPMENT

TECHNOLOGY BASE

The weapon systems capabilities presented in this handbook benefitted from past investments in the Army technology base. Just as they were shaped by previous investment decisions and technological progress over the last two decades, today's vision of the future battlefield, our resultant investment strategy and technology base plan and program will shape our Army of the future. Our vision is one of a well trained, well equipped and ready Army, today and tomorrow, capable of executing its role as America's strategic land force, anywhere in the world, anytime.

Today's AirLand Battle Doctrine contains specific objectives for the conduct of simultaneous operations over the full breadth and depth of the battlefield. Accomplishment of these objectives requires the warfighting means to defeat the enemy in each area. Systems must possess superior technology to: Destroy the enemy force in close operations; delay/disrupt follow-on forces through deep operations; and conduct rear area operations to retain freedom of action for sustainment and movement of our reserves. Army warfighting concepts continue to evolve and include the AirLand Battle Future concept for 15 years into the future and Army 21 which spans out to 30 years into the future. Some battlefield trend forecasts with definite technological implications include: Expanded close operations area; shortened timelines for combat execution; accelerated tempo of operations; simultaneous deep and close operations; and defensive force capabilities to choose the time and place of engagement.

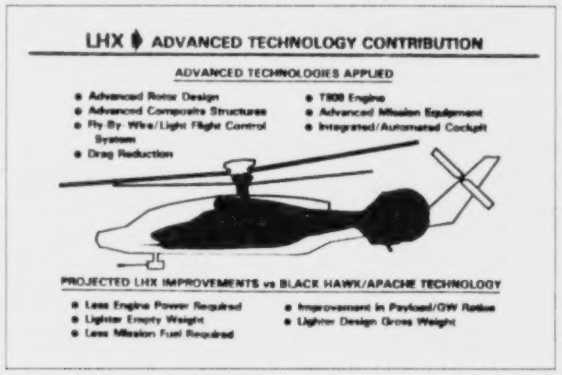

AIRLAND BATTLE
...CONDUCT SIMULTANEOUS OPERATIONS OVER THE FULL BREADTH and DEPTH OF THE BATTLEFIELD
DEEP OPNS
•DELAY
•DISRUPT
CLOSE OPNS
•DESTROY
REAR OPNS
•FREEDOM OF ACTION

To achieve our vision of the future we must continue to modernize. This requires integration of new concepts, designs, training and technologies with new equipment. To guide this modernization we have initiated functional area modernization plans that link requirements to development, acquisition, fielding and sustainment over time within fiscal constraints. The first two such plans are the Army Aviation Modernization Plan and the Heavy Force Modernization Plan. These modernization plans define the basic weapon system timeframes and characteristics needed to defeat the threat. The Army Technology Base Master Plan contains the technological underpinning for these modernization plans and provides top down guidance to the technology base community to:

- Ensure the Army's technology base program supports the Army's most critical warfighting capability needs.
- Balance the technology base across several dimensions:
  (1) near-, mid-, and far-term needs;
  (2) technology "push" vs requirements "pull;" and
  (3) proper balance between weapon systems and other requirements to sustain the Army on the modern battlefield.
- Distribute technology base resources in four areas: systems of the future, supporting capabilities, solutions to systemic issues, and emerging technologies.
- Seize and retain the technological initiative through such endeavors as Competitive Strategies, Balanced Technology Initiatives (BTI), and sound technology forecasts.
- Increase return on investment by leveraging the research and development efforts being conducted outside the Army.
- Speed the fielding of advanced technology through a focused set of Advanced Technology Transition Demonstrations (ATTDs).
- Restore Army technology base program and plan stability, thereby improving product quality, efficiency, and responsiveness to the user.

- Provide top-down guidance to all Army organizations and create an atmosphere which will allow them sufficient responsibility, authority, and flexibility to seize the science and technology initiative and pursue the most promising, innovative opportunities.

The pay-off from a sound technology base is illustrated by its contribution to LHX system characteristics as shown in Figure 1. Forecasted benefits of key technology efforts in support of the Heavy Force Modernization Plan are shown in Figures 2 and 3 for the Block III Tank and Advanced Field Artillery System (AFAS), respectively.



LHX ▶ ADVANCED TECHNOLOGY CONTRIBUTION

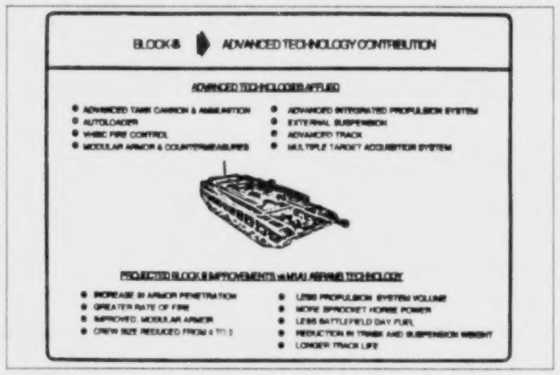
ADVANCED TECHNOLOGIES APPLIED

- Advanced Rotor Design
- Advanced Composite Structures
- Fly-By-Wire/Light Flight Control System
- Drag Reduction
- T800 Engine
- Advanced Mission Equipment
- Integrated/Automated Cockpit

PROJECTED LHX IMPROVEMENTS vs BLACK HAWK/APACHE TECHNOLOGY

- Less Engine Power Required
- Lighter Empty Weight
- Less Mission Fuel Required
- Improvement in Payload/GW Ratios
- Lighter Design Gross Weight

Figure 1



BLOCK III ▶ ADVANCED TECHNOLOGY CONTRIBUTION

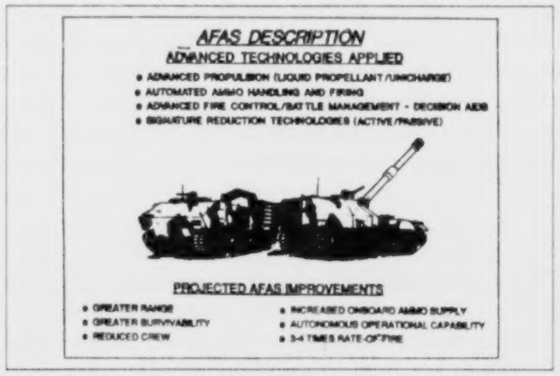
ADVANCED TECHNOLOGIES APPLIED

- ADVANCED TANK CANNON & AMMUNITION
- AUTOLOADER
- VHSIC FIRE CONTROL
- MODULAR ARMOR & COUNTERMEASURES
- ADVANCED INTEGRATED PROPULSION SYSTEM
- EXTERNAL SUSPENSION
- ADVANCED TRACK
- MULTIPLE TARGET ACQUISITION SYSTEM

PROJECTED BLOCK III IMPROVEMENTS vs M1A1 ABRAMS TECHNOLOGY

- INCREASE IN ARMOR PENETRATION
- GREATER RATE OF FIRE
- IMPROVED MODULAR ARMOR
- CREW SIZE REDUCED FROM 4 TO 3
- LESS PROPULSION SYSTEM VOLUME
- MORE SPROCKET HORSE POWER
- LESS BATTLEFIELD DAY FUEL
- REDUCTION IN TRACK AND SUSPENSION WEIGHT
- LONGER TRACK LIFE

Figure 2



AFAS DESCRIPTION

ADVANCED TECHNOLOGIES APPLIED

- ADVANCED PROPULSION (LIQUID PROPELLANT/UNICHARGE)
- AUTOMATED AMMO HANDLING AND FIRING
- ADVANCED FIRE CONTROL/BATTLE MANAGEMENT - DECISION AIDS
- SIGNATURE REDUCTION TECHNOLOGIES (ACTIVE/PASSIVE)

PROJECTED AFAS IMPROVEMENTS

- GREATER RANGE
- GREATER SURVIVABILITY
- REDUCED CREW
- INCREASED ONBOARD AMMO SUPPLY
- AUTONOMOUS OPERATIONAL CAPABILITY
- 3-4 TIMES RATE-OF-FIRE

Figure 3

Future weapon systems will be shaped in large part by our ability to identify and exploit key emerging technologies and our ability to speed the fielding of these technologies and advanced systems through focused Advanced Technology Transition Demonstrations. The Army's key emerging technologies are:

Advanced Materials and Materials Processing - Advanced materials offer a number of different approaches to higher performance and/or lower cost weapons and support systems. In the materials area, high strength fibers, superconductivity, high-performance ceramics, and organic and metal-matrix composites are on the horizon. Advanced processing includes the creation of new material properties and means for more rapid or economical fabrication of complex shapes. For many military applications, materials are subjected to conditions far more demanding than those found in the industrial sector. For the Army, high-strength, highly durable materials translate into broad new capabilities ranging from lightweight systems providing increased mobility to significant reductions in equipment failures and downtime, all of which improve field fighting capability and reduce costs. Superconducting materials offer the promise of entirely new electronic systems offering major new capabilities ranging from greatly increased data processing speeds to lightweight motors and generators.

Microelectronics, Photonics and Acoustics - Microelectronics is the family of technologies that makes it possible to put ever increasing electronic capability in ever smaller packages. Photonic and acoustic devices will support further advances, making possible even more complex operations in smaller, less expensive, more dependable electronic systems with greater capability. They will also provide capabilities which are impossible or impractical now. Perhaps the greatest advantages will emerge in systems employing enhanced computing power, more stable signals, greater communication capability, more survivability, and increased resistance to outside interference and jamming.

Advanced Signal Processing and Computing - Advanced signal processing involves the technologies for manipulating electronic signals to extract items of interest which would otherwise normally be lost in noise, interference, and jamming. The Army requires receivers that can intercept, identify, and locate future enemy communication and radar transmitters in the presence of many other friendly and threat emitters. The majority of these requirements are beyond the areas of interest to industry. Advanced computing has many industrial counterparts and incentives, and the Army is encouraging and closely monitoring industrial efforts in this area. One example is how the Army is exploiting supercomputer technology with two supercomputers located at the Ballistic Research Laboratory and one at the Tank and Automotive Command. A fourth is being procured in FY89 for the US Army Engineer Waterways Experiment Station. The Army High Performance Computing Research Center is to be established at a competitively selected university during 1989.

Artificial Intelligence - Artificial Intelligence (AI) employs computers and other systems to emulate human processes such as reasoning, analyzing, and recognizing. AI uses facts, rules of thumb, and past experiences to make inferences about the world to recommend a course of action. The demonstrated ability of AI to diagnose and prescribe remedies for diseases, and to diagnose electronic and mechanical failures will permit use of fewer medical and maintenance personnel requiring less training. Commander's decision-making aids will permit examining more options more rapidly with smaller staffs, enabling us to respond within the enemy's decision cycle. AI can help the Army accelerate its pace on the complex modern battlefield. It can enhance the Army's planning and decision-making at many levels, leading to significant increases in force survivability, lethality, agility, and reduced manpower and overhead costs.

Robotics - Robotics is the technology of autonomously functioning systems, which sense the outside world, respond through a set of rules or AI, and control an actuator to achieve a desired purpose. Robots can replace humans in many applications, providing a combat multiplier or reducing the risk of casualties. Some examples include robotic materiel handlers for logistics and advanced autoloaders for tanks or artillery. Robotic weapon systems will permit one soldier to do the job of many, and in some instances may eliminate the need for personnel. Robotic manufacturing will reduce the procurement cost of Army systems.

Biotechnology - Biotechnology offers many unique opportunities for the Army, and its full potential has yet to be assessed. At the outset, this technology can provide the protection sought against chemical and biological agents. Soldier performance may be greatly enhanced by vaccines, protective or energizing compounds and enhanced nutrients. Potential exists for development of sensors that can replicate portions of the human system. For truly autonomous systems, the ability to develop small cognitive devices holds much promise. It is also likely that improved understanding of biotechnology will permit the development of processes that can yield new materials, or materials at substantially reduced costs.

Directed Energy - Directed Energy Weapons (DEW) use lasers, high-powered microwaves, or beams of charged or neutral particles to blind a sensor, or to cause instant catastrophic destruction. Directed energy efforts also include protection of US systems against enemy weapons. Laser communications allow very wide bandwidth transmission using very short bursts and narrow beams, which are extremely difficult to detect, intercept, or jam. Laser radar employs a narrow focused beam of energy to sense and track objects. DEW offer important potential advantages such as speed-of-light attack (which the target cannot avoid by maneuver), multiple rapid shots, and unique terminal effects. Laser radar and communication systems offer security, bandwidth, and other capabilities not available in conventional systems.

Power Generation, Storage and Conditioning - Power generation/storage/conditioning technologies enable generation and delivery of electrical power of the right quality and quantity at the time it is needed. It includes advanced generators, batteries, controls, and pulse power storage and waveform shaping devices. Batteries which are rechargeable in peacetime but cheap enough to be discarded in wartime are under development, as are batteries with much greater power density, longer shelf life, and better performance at low temperature. Motor generators which are smaller, lighter, and require less maintenance, will provide major battlefield advantages. Generators are now a major source of the acoustic and thermal signatures of weapons and command posts; enhanced survivability will result from reduction of signatures. Advanced power conditioning and load control systems will allow operation of systems with smaller, more efficient generators. The practicality of directed energy weapons and of electromagnetic guns is now limited by the inability to provide very high pulsed power levels in practical systems. This is an area of unique interest to the military. Very compact sources of high power (generators and batteries), storage devices (advanced fly-wheel concepts, fast storage batteries, and advanced capacitors), high-power super-fast switches, and other power manipulation and control devices are needed.

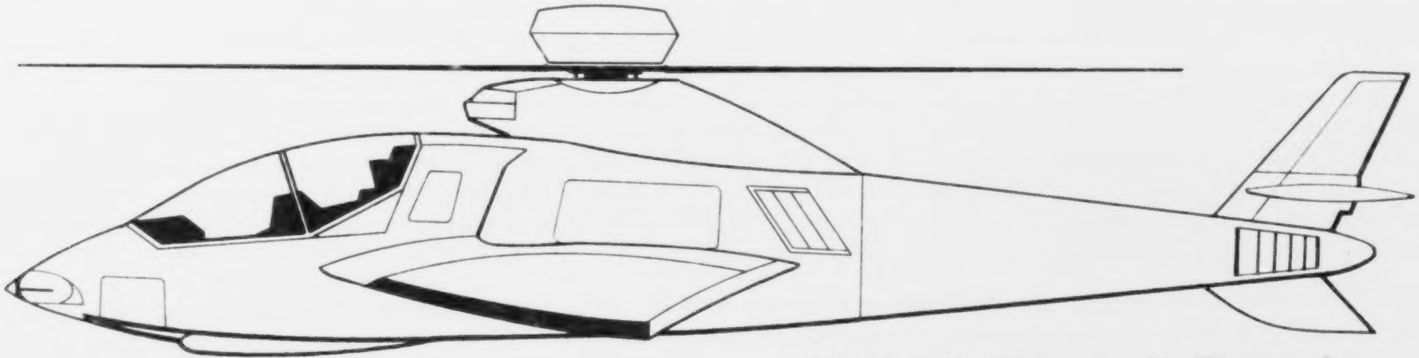
Low Observables - Low observables comprise the technologies that prevent the detection and/or identification by advanced sensors. This capability of rendering targets "invisible" is achieved by combinations of materials, design, and operation. Of the many emerging technologies foreseen, this is one that has significant impact on the Army and least apt to be the subject of any significant investment by industry. With the advent of smart weapons and the next generation of brilliant weapons, the emphasis on low observables will increase. DEW that minimize the possibility of escape by maneuver will further increase the need for reduced visibility in the battlefield of the future.

Advanced Propulsion - Advanced propulsion technologies apply to rotorcraft, wheeled and tracked vehicles, and missiles. A new DOD/NASA propulsion initiative titled "Integrated High Performance Turbine Engine Technology" was started in FY88 with the objective of doubling aircraft propulsion performance by the year 2000. Improvements in the specific fuel consumption of 30% and increased power-to-weight ratio of 80% are envisioned. Future combat vehicle propulsion needs are met through advanced designs and technologies stressing the military attributes of low volume, high performance, improved fuel economy, and improved supportability. Through ongoing programs, ground combat vehicles in the late 1990's will have propulsion systems that deliver 10% more power in half the volume and with fuel economy improvement of 50% over the current M1A1 power pack. Advanced missile propulsion performance requires increased thrust and range for the Airland Battle-Future while using insensitive fuels.

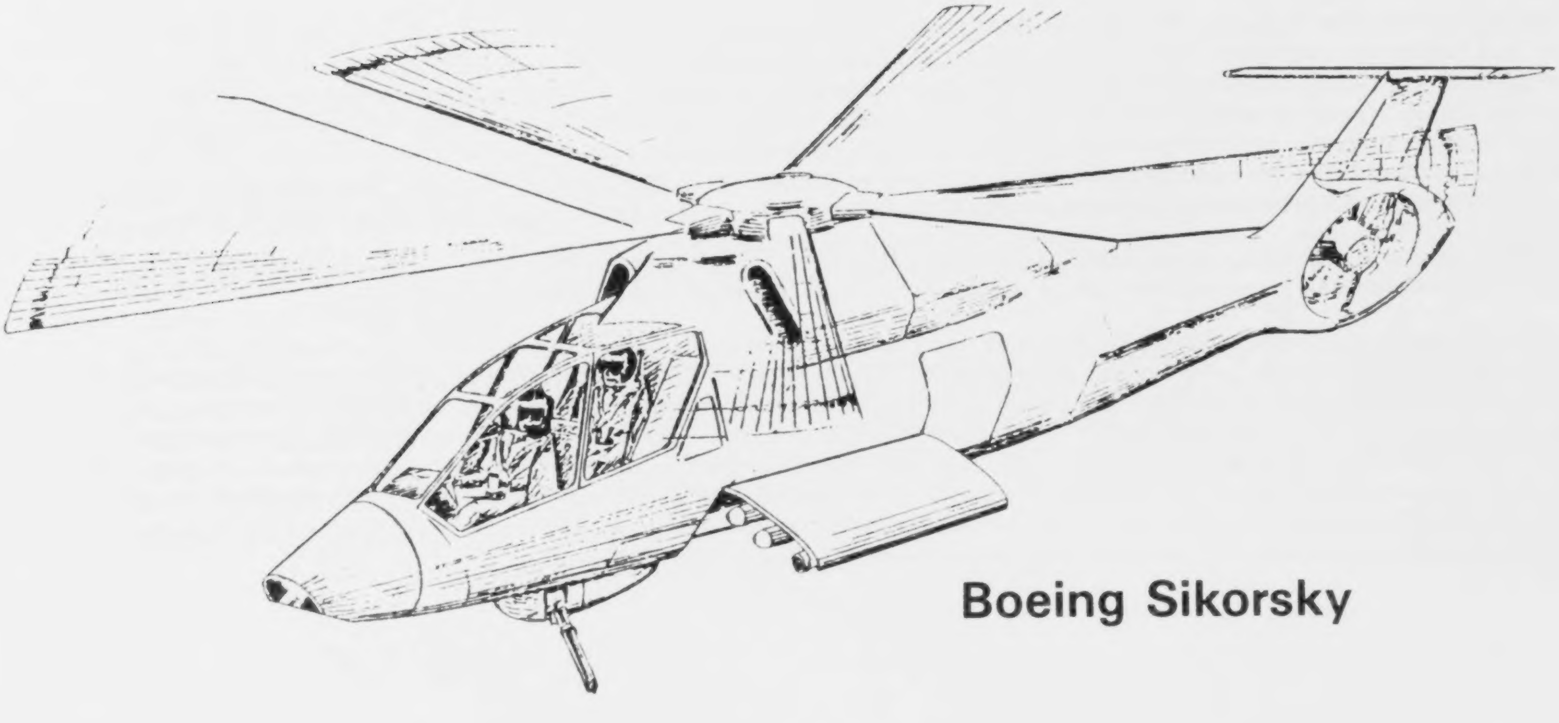
Space - The ultimate "high ground," space is a logical extension of the battlefield. Space technology and systems merge intelligence, communications, weather, terrain, positioning and targeting to provide the tactical commander with a comprehensive knowledge of the battlefield.

Protection/Lethality - Research and technology activities associated with Protection/Lethality have been augemented and accelerated by the Army in order to counteract a highly dynamic threat modernization rate with technologically superior future US forces. Protection/Lethality encompasses a wide range of critical efforts focused toward exploiting technological opportunities which will provide our future forces with improved survivability and with warfighting capabilities which will exceed the projected threat. These efforts involve exploration and demonstration of technologies addressing armor materials and design, advanced gun propulsion and missile systems, warhead materials and design, insensitive propellants and explosives, precision guidance, and fire control. Gun propulsion technologies being pursued include unicharge, electromagnetic/electrothermal and liquid propellant. These technologies are being developed to provide: significant increase in the launch velocity; reduction in the logistic burden for propellant; and increased rate of fire. Key activities in protection also include chemical/biological defense, smoke, and laser protection.

LHX DEMONSTRATION/VALIDATION



Bell McDonnell Douglas



Boeing Sikorsky

LHX (Light Helicopter)

MISSION:

The Light Helicopter (LHX) is the Army's next generation rotorcraft which will replace the aging unarmed scouts and AH-1 attack helicopters. This aircraft in the Army's air cavalry and attack organizations will significantly expand the Army's capability to conduct tactical operations in all types of terrain, adverse weather and battle environment, during day/night operations with increased survivability. The LHX with its increased speed, survivability, air-to-air capability and mission equipment will enhance the combat operations of supported forces. The LHX supports forward deployed forces by conducting both close and deep operations with improved lethality and survivability. The force agility will be significantly improved with LHX. Its 1260 NM self-deployment range and smaller size, compared to the AH-64, will improve Army aviation's rapid strategic deployment. One helicopter, the LHX, will be able to perform the missions currently being performed by three types of helicopters (AH-1, OH-58 and OH-6) better with greater operational and support efficiency.

CHARACTERISTICS:

Weight:	7,500 lbs (empty weight)
Speed:	170 + knots (cruise)
Endurance:	2.5 hours (+ .5 hour reserve)
Crew:	Two pilots (single pilot operable)
Mission Equipment Package:	Air-to-ground and air to air missiles, provisions for additional stores and a turret mounted cannon, night vision pilotage system, helmet mounted display, electro-optical target acquisition and designation system, aided target classification, and integrated displays

SOVIET COUNTERPART:

Current Soviet HIND series helicopters and developmental HOKUM and HAVOC series helicopters present the air-to-air threat.

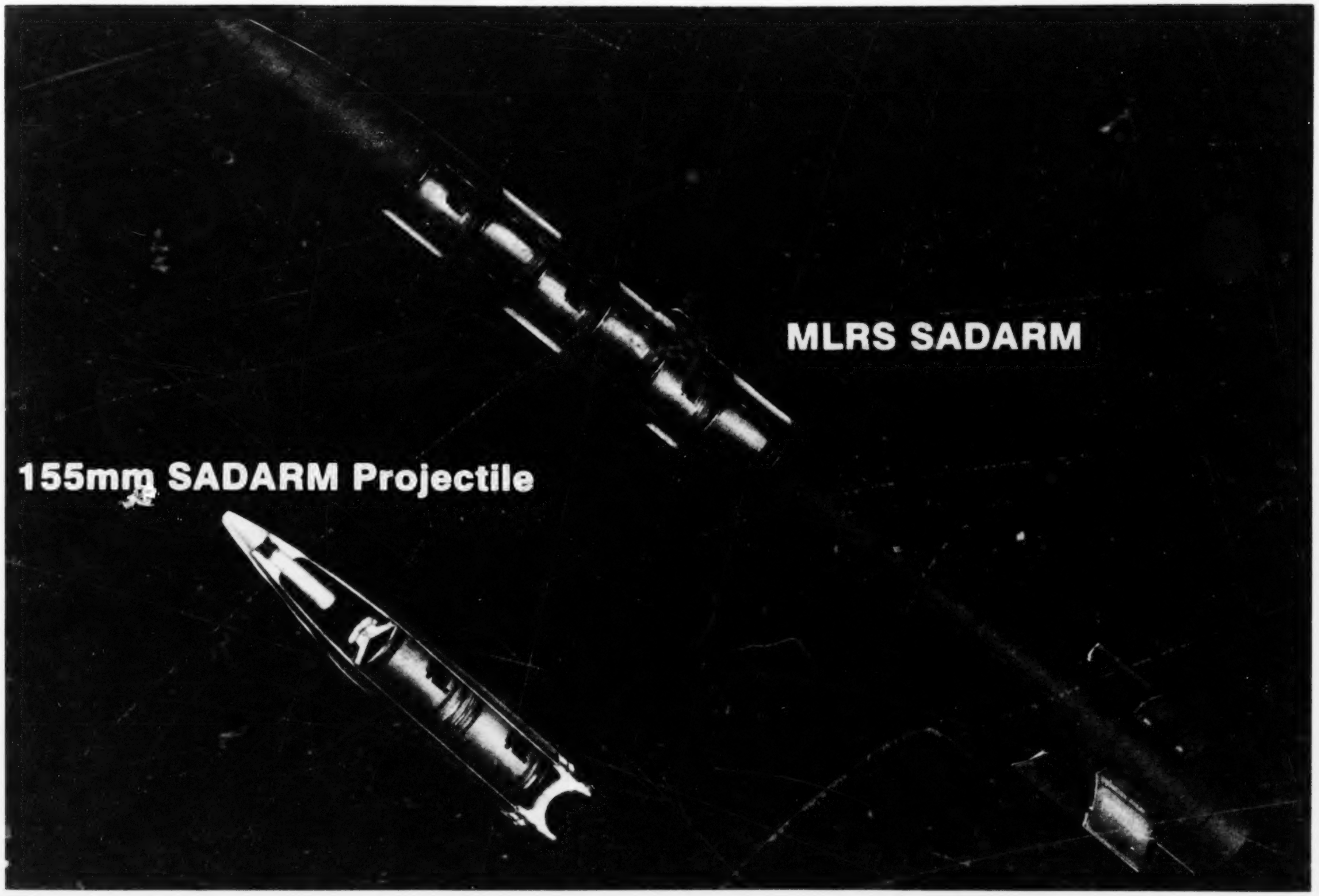
PROGRAM STATUS:

LHX was approved in June 1988 for entry into its Demonstration/Validation phase of development. The LHX Full Scale Development Milestone II decision is scheduled for December 1990. LHX will be fielded in November 1996. The T800 engine, currently in Full Scale Development, will complete Preliminary Flight Rating Testing in 1989 followed by engine qualification testing.

CONTRACTORS:

LHX Demonstration/Validation competitive contractor teams are Boeing/Sikorsky and McDonnell Douglas/Bell. T800 contractor team for Full Scale Development continuation is Garrett/Allison (LHTEC).

The SADARM System


MLRS SADARM
155mm SADARM Projectile

Sense and Destroy Armor (SADARM)

MISSION:

SADARM is a comparatively low cost, sensing submunition designed to detect and destroy lightly armored vehicles, primarily self-propelled artillery. SADARM is the first of the Army's new family of fire and forget "SMART" munitions. The submunition is launched from 155 howitzers or via the Multiple Launch Rocket System (MLRS). After launch, the submunition is dispensed from its carrier over the target area and searches for appropriate targets using a dual mode (combination millimeter wave and infrared) sensing mechanism. Once a target is detected, SADARM fires an explosively formed penetrator, which travels at an extremely high velocity to penetrate the top of target vehicles.

CHARACTERISTICS:

	155mm	MLRS
Caliber:	5.8 In	6.9 In
Weight:	27 lbs	30 lbs
Range:	18 km*	32 km*
Number Submunitions:	2	6

*Range of delivery system; other characteristics apply to submunition.

SOVIET COUNTERPART:

There is no known Soviet Counterpart.

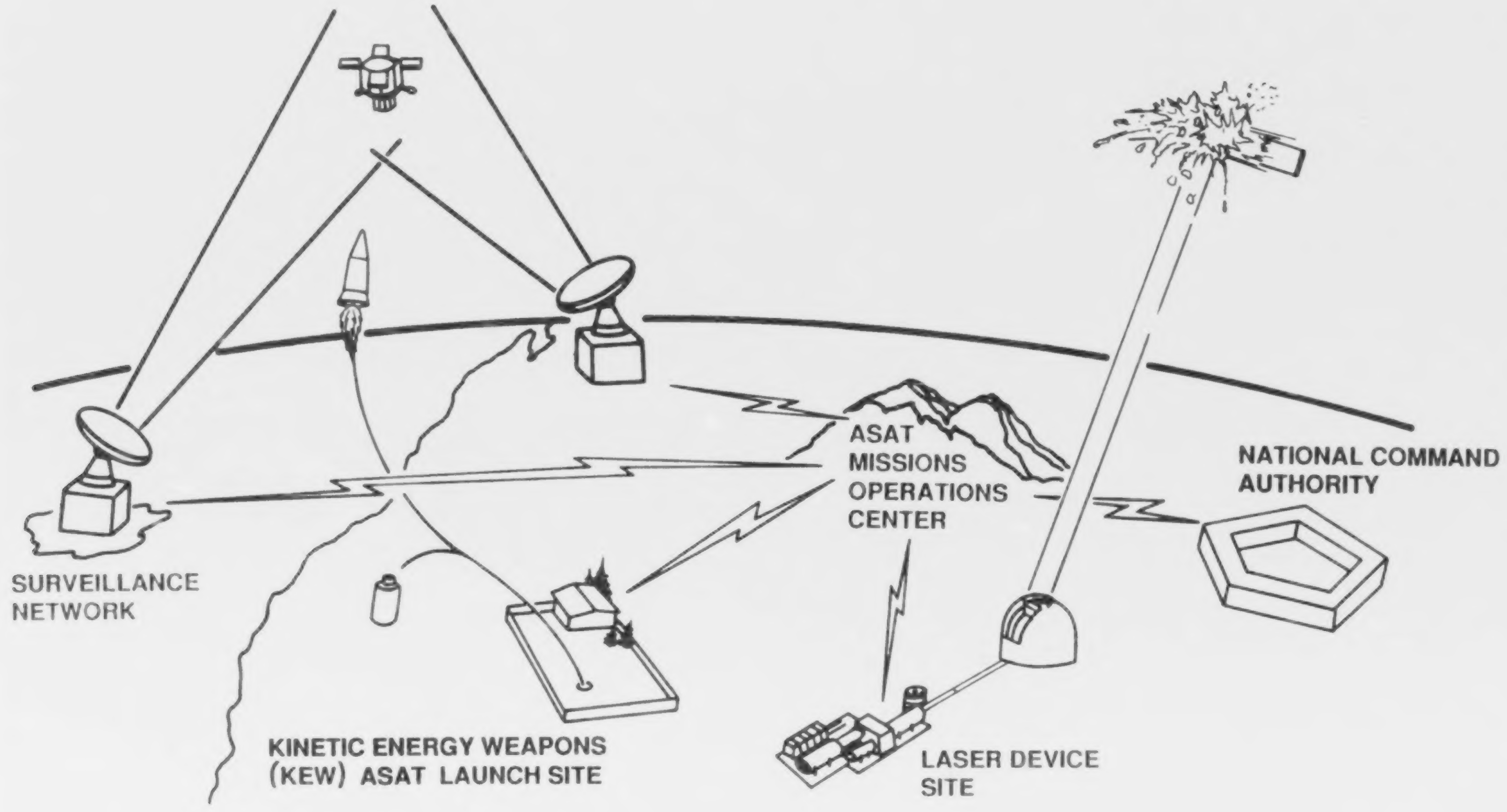
PROGRAM STATUS:

SADARM was approved in March 1988 to enter Full Scale Development (FSD). Production is projected for early 1992. Development effort during FY90 will consist of 155mm projectile Technical Test (TT), 155 mm Force Development Test and Evaluation (FDTE), and MLRS dispenser development and testing. SADARM is scheduled to be fielded in FY93.

CONTRACTORS:

Honeywell (Minneapolis, MN)
Aerojet (Aczusa, CA)

ASAT SYSTEM



SURVEILLANCE NETWORK

ASAT MISSIONS OPERATIONS CENTER

NATIONAL COMMAND AUTHORITY

KINETIC ENERGY WEAPONS (KEW) ASAT LAUNCH SITE

LASER DEVICE SITE

Ground Based ASAT System

MISSION:

The objective of the Ground Based Anti-satellite (ASAT) System is to achieve space control. Space control is a warfighting mission of the U.S. Space Command and its components. ASAT weapons and their command and control elements constitute the space forces necessary to execute space control operations. Accomplishing this mission requires the ability to provide space surveillance, actively defend friendly space systems against a variety of threats, disrupt, degrade, and destroy the warfighting potential of enemy space systems, and engage enemy forces attacking in space.

The military strategy for space supports U.S. policy objectives and Army mission requirements: deterrence and, if necessary, defense against enemy attack; assured access to and freedom of action in space; negation of hostile space systems; and enhancement of the operations of U.S. and Allied forces. The ASAT system will operate across the spectrum of conflict.

SOVIET COUNTERPART:

Indicative of the Soviets' military program of space is their development and maintenance of the world's only currently operational ASAT system, a ground-based orbital interceptor. Using a radar sensor and a pellet-type warhead, the interceptor can attack all current low-altitude satellites. Other Soviet systems have ASAT capabilities. The nuclear-armed GALOSH ABM interceptor deployed around Moscow has an inherent ASAT capability against low-altitude satellites. Some of the lasers located at the Sary Shagan Missile Test Center may be capable of damaging sensitive components onboard satellites. The Soviets also have the technological capabilities to conduct electronic warfare against space systems.

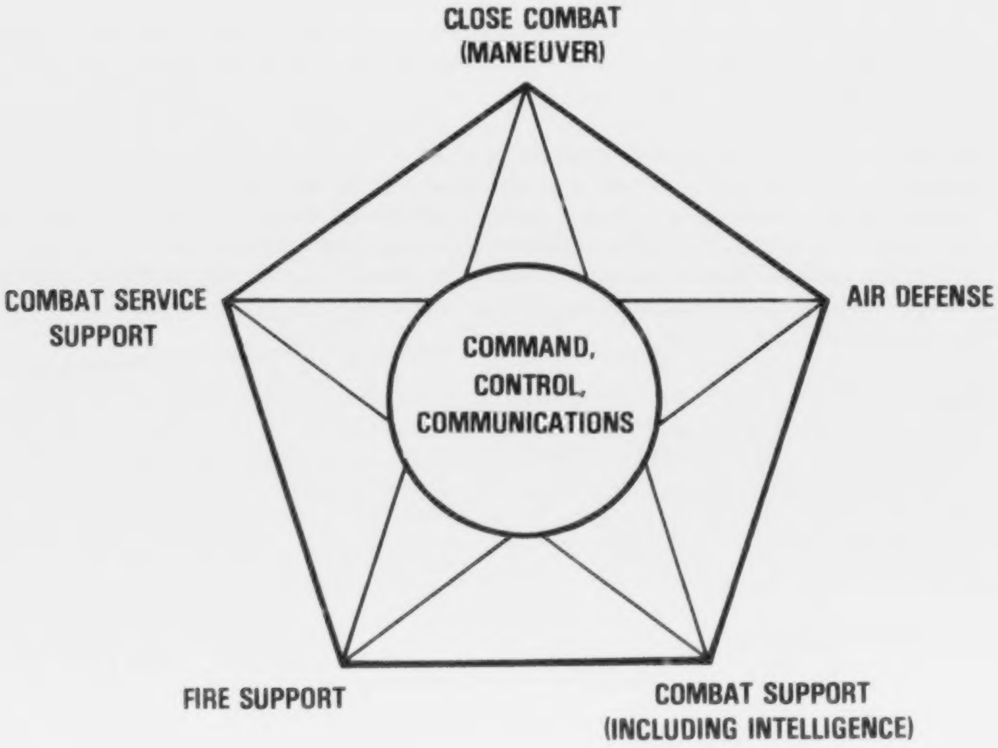
PROGRAM STATUS:

During the next year the Army will establish a Joint Program Office (JPO) for the kinetic energy weapon systems. The Navy will provide a Deputy Program Manager. Options for sea and/or land-based versions will be presented to the Defense Acquistion Board at Milestone I for a final concept selection. The JPO will also include an element responsible for integration with the space surveillance network and the Battle Management, Command, Control, and Communications (BM/C3) system. An initial Cost and Operational Effectiveness Analysis, and a Test and Evaluation Master Plan will be developed along with a life cycle cost estimate for both the kinetic energy weapons system and the surveillance and BM/C3 portion of the program.

CONTRACTORS:

To be determined

The weapon systems described on the following pages are categorized by mission areas beginning with close combat. A brief explanation of the vital contribution of each mission area begins each section. It must be emphasized that these mission areas—the weapon systems and soldiers who operate them—work inextricably together on the battlefield. That is the essence of the combined arms concept and the belief that a small quality Army, working in a fully synchronized manner, will be able to hold its own against one with superior numbers. For this reason, our Research, Development and Acquisition planning is linked early and continuously with doctrine, training and force structure requirements to permit a coordinated advance across all these mission areas. In short, we strive for a balanced Army. There must be no weak links in the equipment we provide our soldiers. The logo below indicates how mission area teamwork and a balanced equipment posture is crucial to victory on the battlefield.


CLOSE COMBAT (MANEUVER)
COMBAT SERVICE SUPPORT
AIR DEFENSE
COMMAND, CONTROL, COMMUNICATIONS
FIRE SUPPORT
COMBAT SUPPORT (INCLUDING INTELLIGENCE)

CLOSE COMBAT

The Close Combat mission area relates to the application of direct combat power. As the term indicates, close combat involves two adversaries standing eyeball to eyeball, with man pitted against man, weapon against weapon. This mission area includes such items as tanks, fighting vehicle systems, direct line-of-sight weapons, and short-range mortars that are used by the infantryman.

Abrams Tank

MISSION:

The Abrams tank is the Army's primary ground combat weapon system for closing with and destroying enemy forces using mobility, firepower, and shock action. Its special armor, compartmentalization of fuel and ammunition stowage, automatic fire detection and suppression system, and high agility and mobility provide the crew with the greatest possible levels of protection on the modern battlefield—protection levels which exceed those of any other tank. The M1A1 Abrams added a 120mm smoothbore cannon and a Nuclear, Biological, Chemical (NBC) microclimatic cooling system to the already proven combination of thermal sight, laser rangefinder, and full stabilization to provide a combat vehicle capable of operating under all climate and light conditions, as well as in an active chemical environment. The 1500-horsepower turbine engine and improved suspension provide the consistently superior handling and maneuverability that allow the tank to traverse the battlefield quickly, thus decreasing its exposure to threat direct and indirect fire weapons. Crew survivability, enhanced lethality, and superior mobility combine to produce the most combat effective tank the Army has ever fielded. The Abrams Block II is in Full Scale Development today and will provide enhanced survivability, improved target acquisition and fire control equipment, and improved reliability to the Abrams tank fleet when it enters production in 1992 as the M1A2.

CHARACTERISTICS:

Length:	387 inches	Secondary Armament:	One .50 cal machinegun
Width:	144 inches		Two 7.62mm machineguns
Height:	96 inches	Power Train:	1500 hp gas turbine
Weight:	67 tons		engine w/4 speed
Top Speed:	41.5 mph		automatic transmission
Crew:	4	Fire Control:	Thermal Imaging Sight;
Main Gun:	120 mm		Laser Rangefinder

SOVIET COUNTERPART:

Over the past decade the Soviets have conducted an intensive armor modernization effort and have fielded several thousand T-64's and T-72's with enhanced armor protection and firepower. In addition, they are fielding the T64B, T-80, and FST I tanks which are capable of launching Anti-Tank Guided Missiles (ATGM) through their main gun tubes.

PROGRAM STATUS:

The Abrams tank is presently in its ninth year of production. Over 5500 tanks are in the field as of the beginning of 1989. By the end of FY89 all armor units in US Army Europe and most active component armor units in CONUS will be Abrams equipped. Abrams is also being fielded to the Reserve Components. Abrams Block II (M1A2) will enter production in 1992.

CONTRACTORS:

General Dynamics, Land Systems Div. (Sterling Heights, MI)
GMC, Allison Transmission Div.(Indianapolis, IN)
Hughes Aircraft Corp. (Culver City, CA)
Textron Lycoming (Stratford, CT)
Garrett AiResearch (Torrance, CA)
Cadillac Gage (Detroit, MI)
Honeywell Inc. (Hopkins, MN)
Kollmorgen (Northhampton, MA)
Singer-Kearfott (Little Falls, NJ)
Computing Devices of Canada
(Nepean, Ontario)

Bradley Fighting Vehicle Systems (BFVS)

MISSION:

The Bradley Fighting Vehicles provide the mechanized infantry with a full-track, lightly armored fighting vehicle, and scout and armored cavalry units a vehicle for their screening, reconnaissance, and security missions. Both the Infantry Fighting Vehicle (IFV) and Cavalry Fighting Vehicle (CFV) have a two-man turret which mounts the 25mm automatic stabilized cannon, its primary armament, supported by the TOW antitank guided missile system, and the 7.62mm coaxial machinegun. The M2 and M2A1 IFVs have, in addition, six 5.56mm firing port weapons positioned along the side and rear of the vehicle. The M2A2 IFV has only two firing port weapons positioned at the rear. The overall mobility of the vehicle is comparable to that of the M1 tank. The IFV carries a three-man crew—(commander, gunner, and driver) and six infantrymen. The CFV carries a three-man crew (commander, gunner, and driver) and two scouts.

CHARACTERISTICS:

Weight:	60,000 lbs (M2/M3A2 w/o Reactive Armor)	Crew:	3
		Power Train:	600 hp Diesel
Length:	21.5 ft	Cruising Range:	300 miles
Height:	9.75 ft	Road Speed:	38 mph
Width:	10.5 ft	Swim Speed:	4.4 mph
Main Armament:	25mm Cannon		
Secondary Armament:	TOW, 7.62mm Coaxial MG, Firing port weapons (IFV Only)		

SOVIET COUNTERPART:

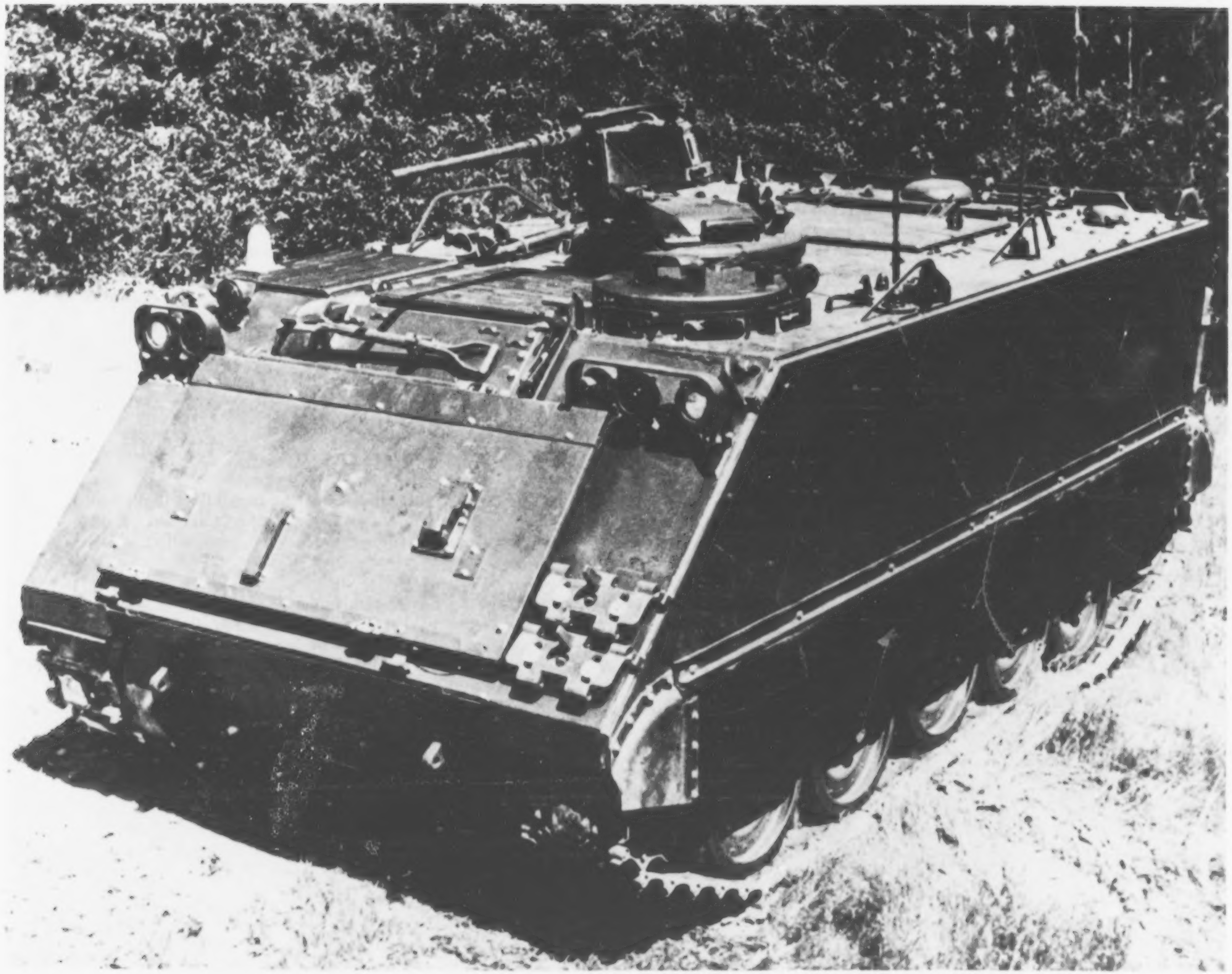
The Soviet BMP has been in the field in quantity for well over a decade and was considered the world's best fielded infantry fighting vehicle. It mounts a 73mm smoothbore cannon, an AT3, AT4, or AT5 antitank guided missile, and permits the infantry squad to fire from the inside. A variant with a 30mm gun, the BMP-2, which fires the AT4 or AT5, is also being widely fielded.

PROGRAM STATUS:

Bradley production has built up to a rate in excess of 50 vehicles per month and vehicle fielding is proceeding smoothly. To date 33 battalion sized units, including four ARNG battalions, have fielded the Bradley. The FY90 budget provides for 600 Bradleys. A major modification, which incorporates the more lethal TOW 2 missile system into the vehicles, is in production and began fielding in 1987. These modified vehicles have been designated M2A1 and M3A1 Bradleys. A decision that incorporates increased survivability enhancements was approved during 1987. These enhancements include: spall liners in the troop compartments, enhanced applique armor, revised internal restowage of fuel and ammunition and provisions for reactive armor. These modifications are being retrofitted into the M2A1 and M3A1 Bradleys currently fielded. Bradleys with the increased survivability enhancements have been designated as M2A2 and M3A2 vehicles.

CONTRACTOR:

FMC Corp. (San Jose, CA)
General Electric Corp. (Pittsfield, MA)
Cummins (Columbus, IN)
Colt Industries (Hartford, CT)
Hughes Aircraft Co. (El Segundo, CA)
Ford Aerospace (Newport Beach, CA)
Honeywell(Minneapolis, MN)
RCA (Burlington, MA)
Chrysler Corp. (Huntsville, AL)
McDonnell Douglas (Mesa, AZ)



M113A3 Armored Personnel Carrier

MISSION: The M113A3 is a product improved, aluminum armored, full-tracked personnel carrier designed to transport troops, equipment, and cargo during combat operations. The A3 configuration adds spall suppression liners, armored external fuel tanks, an upgraded engine and transmission to accommodate the added weight, and fixing points for bolt-on armor. It operates in numerous roles including: Infantry and Engineer Squad Carrier, Mortar Carrier, MED-EVAC Carrier, Maintenance Support Vehicle, and other roles. The M113 carrier fleet will continue to be improved for service in these capacities beyond the year 2000. Because of its mobility, firepower, and armor protection limitations, it cannot fulfill the role of a fighting vehicle and is being replaced in squad carrier and scout vehicle roles of high priority mechanized infantry and cavalry units by the Bradley Fighting Vehicles.

CHARACTERISTICS:

Weight:	27,200 lbs
Armament:	50 Cal. Machinegun
Armor:	Aluminum
Horsepower:	275
Road Speed:	42 mph
Troop Capacity:	13
Cross-Country:	20 mph

SOVIET COUNTERPART: The MTLB amphibious, multipurpose, tracked carrier is used to carry infantry and as a prime mover for towed artillery and antitank guns. It is the closest Soviet counterpart to the US M113 family of tracked carriers.

PROGRAM STATUS: Deliveries of the new M113A3 production began 4th quarter FY86. A modification program is ongoing to implement the Congressionally directed survivability improvement upgrades to the existing M113A2s. These vehicles will be redesignated the M113A3. Applique armor is being developed and will be available for application to selected carriers in the fleet by 4th quarter FY89.

CONTRACTORS:

FMC Corp. (San Jose, CA)
GMC, Detroit Diesel Allison (Detroit, MI)
GMC, Detroit Diesel Allison (Indianapolis, IN)

AH-64 Apache

MISSION:

The Apache is a quick-reacting, airborne antitank weapon. Terrain limitations and the unfavorable balance in NATO/Warsaw Pact armor dictate the need for a system that can fly quickly to the heaviest enemy penetration and destroy, disrupt, or delay the attack long enough for friendly armor and ground units to reach the scene. The Apache is designed to fight worldwide and survive. It is equipped with a Target Acquisition Designation Sight and Pilot Night Vision Sensor (TADS/PNVS) which permit its two-man crew to navigate and attack in darkness and in adverse weather conditions. Although the principal mission of the Apache is the destruction of enemy armor with the Hellfire missile, it is also equipped with a 30mm chain gun and Hydra 70 rockets that are lethal against a wide variety of targets. The Apache has a full range of aircraft survivability equipment and the ability to withstand hits from rounds up to 23mm caliber in critical areas. The Apache is the Army's primary attack helicopter and is complemented by the Cobra.

CHARACTERISTICS:

Max Gross Weight: 17, 400 lbs
Speed: 146 knots
Crew: 2
Armament: Hellfire Missiles, Hydra 70 rockets and 30mm chain gun

SOVIET COUNTERPART:

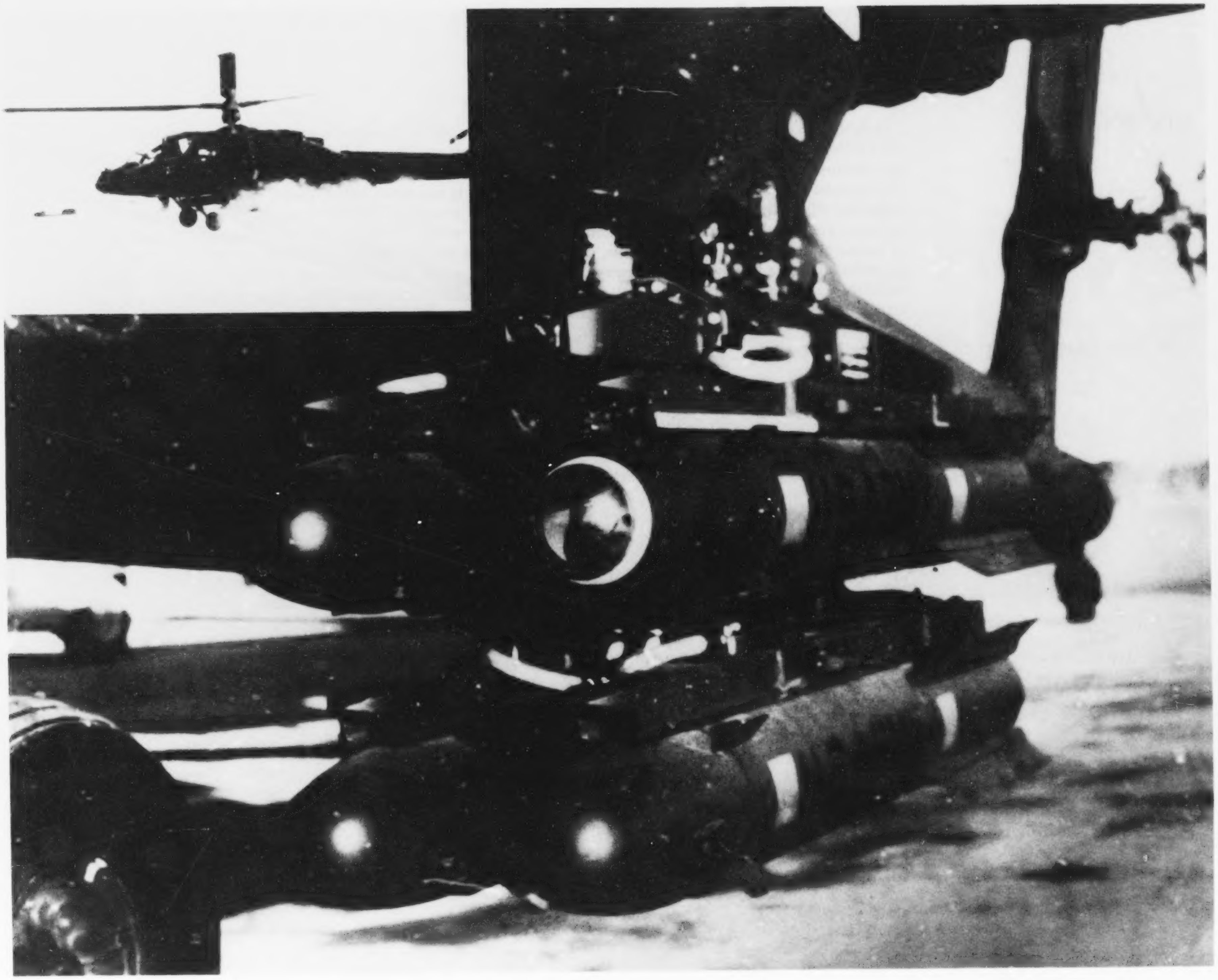
The Soviets have deployed significant numbers of HIND attack helicopters. This helicopter is capable of delivering antitank guided missiles, anti-aircraft missiles, unguided rockets, Gatling gun fire, (cannon fire on some) and bombs. While the HIND is faster than the Apache, it is considered less maneuverable, probably more vulnerable, and less capable of accurate antiarmor fire in darkness and adverse weather. The Soviets are also well on the way in the development of their own version of the Apache, the MI-28 Havoc. This helicopter looks very much like the Apache and is expected to operate in similar fashion. It is expected to be armored; armed with a cannon and to be able to carry various bombs, rockets, and some version of an air-to-air missile. Its primary role will be ground attack with a secondary role of air-to-air. It is expected to reach Initial Operational Capability (IOC) in the near future. The Soviets are also developing the HOKUM attack helicopter which is assessed to be highly maneuverable with a primary role of air-to-air against other helicopters and slow moving fixed-wing aircraft. The West has no counterpart to this helicopter. Its IOC is also expected in the near future.

PROGRAM STATUS:

The first 437 Apaches have been delivered to the Army. Production contracts for 598 aircraft are being executed. The current total program procures 975 AH-64s. The Apache began deployment in FY86. There are 11 Attack Battalions deployed and ready for combat.

CONTRACTORS:

McDonnell Douglas Helicopters (Mesa, AZ)
General Electric (W. Lynn, MA)
Martin Marietta (Orlando, FL)



Hellfire Modular Missile System

MISSION:

Hellfire is a third-generation airborne antiarmor weapon. It is presently employed for use as the main armament of the Apache helicopter. Hellfire homes on a laser spot that can be projected from ground observers, other aircraft and the launching aircraft itself. This enables the Apache-64 to launch its missiles indirectly, in some situations, without seeing its target. The Apache AH-64 can carry up to 16 Hellfire missiles.

CHARACTERISTICS:

Diameter	7
Weight:	99.8 lbs
Guidance	Laser semi-active

SOVIET COUNTERPART

The Soviets have a wide variety of wire, radio, and laser homing antiarmor missiles of varying accuracy and lethality. No accurate comparision is yet possible between Hellfire and Soviet laser homing antitank weapons.

PROGRAM STATUS:

Hellfire is in full production and was fielded with Apache in 1986. There is an aggressive product improvement program ongoing to enhance the missiles lethality against applique (Reactive) armor. A program to harden the seeker against countermeasures will begin in FY90. These missile improvements will ensure the Hellfire system's effectiveness into the 1990's.

CONTRACTORS:

Rockwell International Corporation (Duluth, GA)
Martin Marietta (Orlando, FL)

Army Helicopter Improvement Program (AHIP)

MISSION:

The Army Helicopter Improvement Program (AHIP) OH-58D is the Army's first true scout helicopter. It provides a solution to the need for the combined arms team to fight and defeat the threat during day or night operations, in adverse weather and in high temperature/high altitude conditions. The aircraft system incorporates a new drive train consisting of a four-bladed rotor, 650 HP engine and compatible transmission and tail rotor systems. The Mission Equipment Package incorporated in AHIP consists of a Mast Mounted Sight which provides day and night target acquisition sensors and laser rangefinder designator located above the rotor to maximize aircraft survivability. A highly accurate navigation system permits precise target location information which can be handed off to other aircraft or artillery elements via the airborne target handover system. The laser designator enables AHIP to provide designation for position guided weapons to include Hellfire and precision munitions. The OH-58D will operate in the field artillery aerial observer role and in air cavalry units. Using the Air-to-Air Stinger system, the OH-58D can provide security against threat aircraft. Recently concluded field tests have confirmed the AHIP's utility in the aerial scout reconnaissance role.

CHARACTERISTICS:

Max Gross Weight: 4,500 lbs
Speed: 118 KTAS
Crew: 2

SOVIET COUNTERPART:

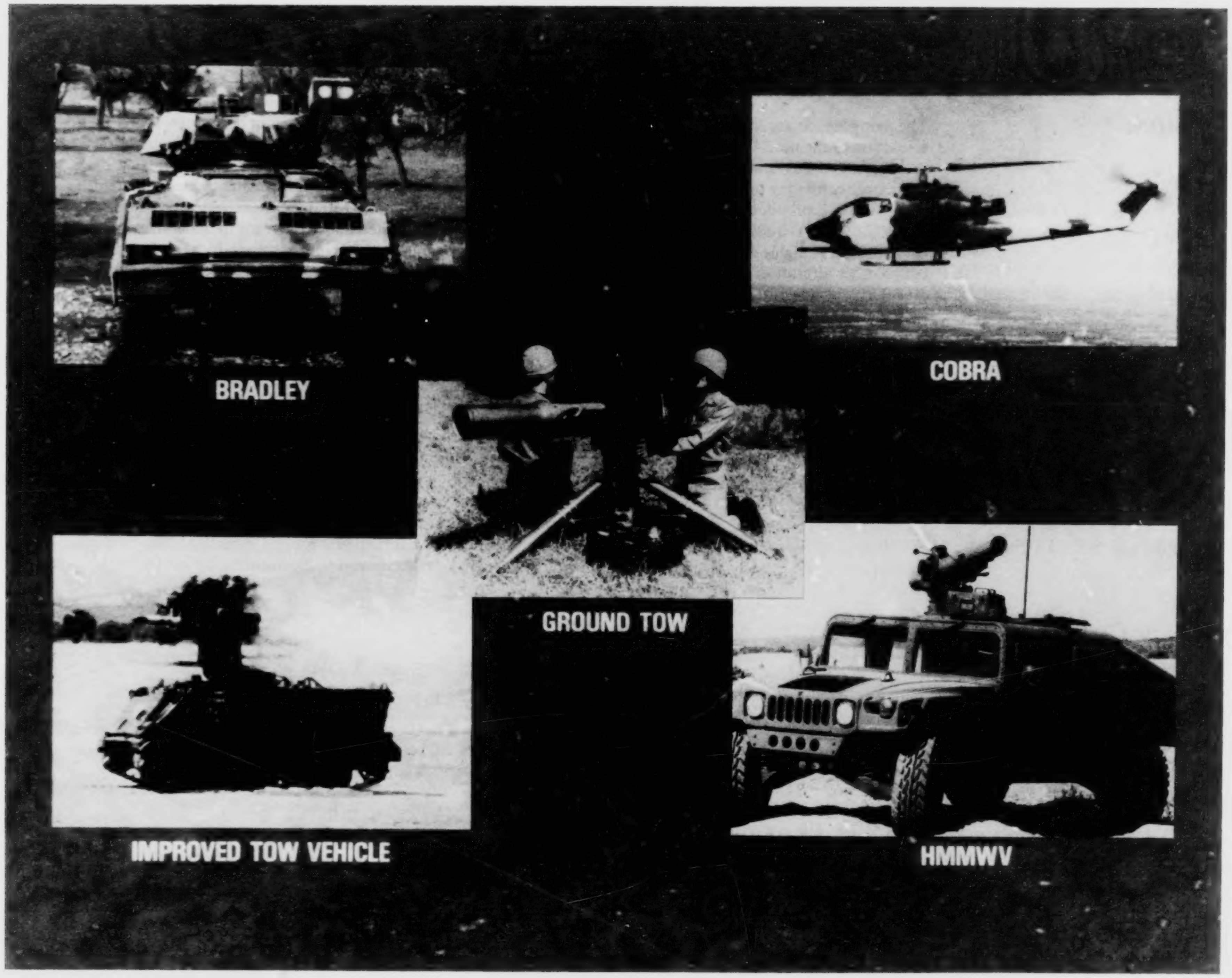
None specifically, but the Soviets have various helicopters used in an artillery spotting and reconnaissance role, such as HINDs, HIPs, and Hoplites.

PROGRAM STATUS:

AHIP is in the fourth year of production. There have been 115 aircraft fielded through December 1988. Aircraft are currently deployed to the training base at Ft Rucker and Ft Eustis and to operational units in CONUS, USAREUR, and Korea.

CONTRACTORS:

Bell Helicopter Textron, Inc. (Ft. Worth, TX)
McDonnell Douglas Astronautics Co. (Monrovia, CA)
Northrop Corp. (Anaheim, CA)
Honeywell Inc. (Sperry Aerospace and Marine Group)(Albuquerque, NM)
Litton Laser Systems (Orlando, FL)
Allison Gas Turbine Operations (Indianapolis, IN)


BRADLEY
COBRA
GROUND TOW
IMPROVED TOW VEHICLE
HMMWV

TOW Missile System

MISSION:

The TOW (Tube-Launched, Optically Tracked, Wire Command-Link Guided) missile is the most powerful antitank weapon used by the infantry. It is found at battalion level in ground units and is also mounted on the Bradley Fighting Vehicle, Improved TOW Vehicle, the High Mobility Multipurpose Wheeled Vehicle (HMMWV) and on the AH-1S Cobra Helicopter. When the missile is fired, a sensor in the launcher tracks a beacon in the tail of the missile. The gunner need only keep his crosshairs on the target. A computer in the launcher corrects any deviation of the missile from the crosshair aim point and sends corrections to the missile via two extremely thin wires that deploy in flight.

CHARACTERISTICS:

Weight (Ground Launcher):	246 lbs
Weight (Missile-cased):	62.4 lbs
Range:	3750 meters
Crew:	3

SOVIET COUNTERPART:

The Soviets have fielded a family of semiautomatic, command to line of sight, anti-tank guided missiles similar to the TOW. The AT-4/SPIGOT is a crew served system with a maximum range of 2000 meters. AT-5/SPANDREL is the vehicular mounted version with a larger missile and a maximum range of 4000 meters. AT6/SPIRAL is the heliborne ATGM mounted on the HIND-E and has a range of 5000 meters.

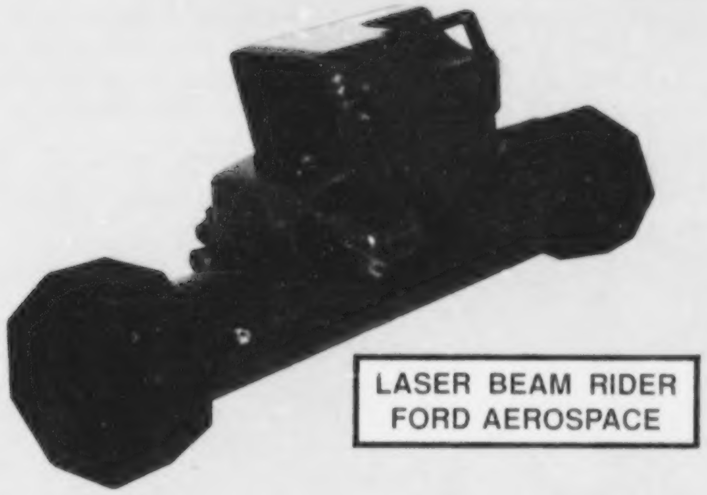
PROGRAM STATUS:

Basic TOW has been in the inventory since 1970. A TOW Thermal Night Sight, an improved warhead-ITOW, and the TOW 2 missiles and modification kits to convert Basic launchers to the TOW 2 configuration have been fielded in USAREUR, EUSA, WESTCOM, FORSCOM, and SOUTHCOM. Fielding to National Guard and Army Reserve Units continues. TOW 2 Initial Operational Capability was met in October 1983 in Europe. The TOW 2A missile, developed to counter Soviet reactive armor, began fielding in Europe in September 1987. There is an aggressive product improvement program, including a TOW 2B warhead development effort (scheduled for FY90 production cut in) that will ensure TOW weapon system effectiveness into the 1990's.

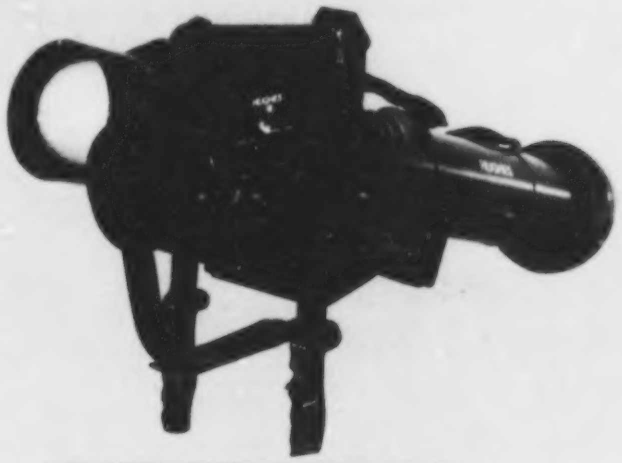
CONTRACTOR:

Hughes Aircraft Company, Tucson, Arizona is currently the sole source prime contractor for the TOW missile. Efforts are underway to establish a second source in FY89 which will allow full competition in the FY91-92 time frame.

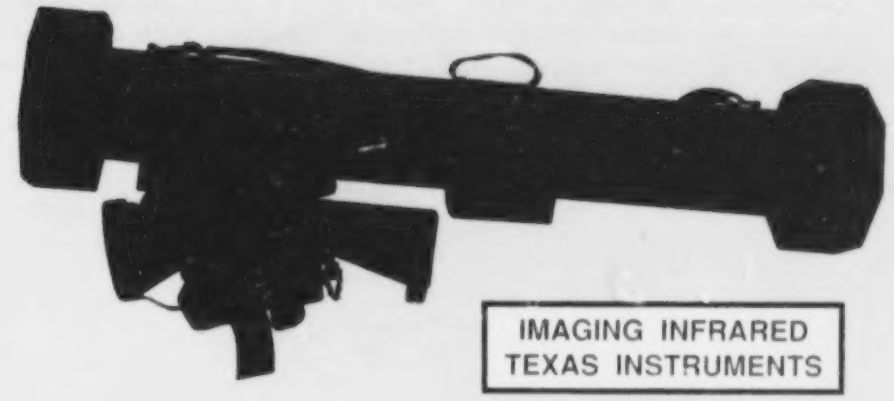
AAWS-M CANDIDATES



LASER BEAM RIDER
FORD AEROSPACE



FIBER OPTIC GUIDANCE
HUGHES AIRCRAFT



IMAGING INFRARED
TEXAS INSTRUMENTS

Advanced Antitank Weapon System—Medium (AAWS-M)

MISSION:

The Advanced Antitank Weapon System-Medium (AAWS-M) will be a one-man portable weapon employed at the infantry platoon level to defeat the current and projected Soviet armor threat. The AAWS-M will be developed to replace the Dragon while addressing its deficiencies. These deficiencies include lethality, range, gunner vulnerability, launch signature and time of flight. The system will be capable of operating in day, night, smoke and other battlefield obscurants, as well as in a countermeasures environment. One of three candidate technologies (Laser Beamrider, Fiber Optic and Imaging Infrared) currently under development will guide the missile to its target.

CHARACTERISTICS:

Weight:	less than 45 lbs
Range:	greater than 1500 meters
Crew:	1
Lethality:	Capable of defeating advanced Soviet armor.

SOVIET COUNTERPART:

The Soviets have fielded a shoulder fired antitank guided missile, AT-7, which is comparable to the Dragon and is their current medium, one-man portable antitank system.

PROGRAM STATUS:

Firm Fixed Price (FFP) contracts for the Proof of Principle (POP) phase awarded in August 1986. The POP phase flight test program was completed 30 November 1988. An RFP for Full Scale Development FSD and Low Rate Initial Production was released to industry in September 1988. The FSD contract will be awarded in April 1989 in which one of the three technologies (and associated contractor teams) will be selected for the FSD phase.

CONTRACTORS:

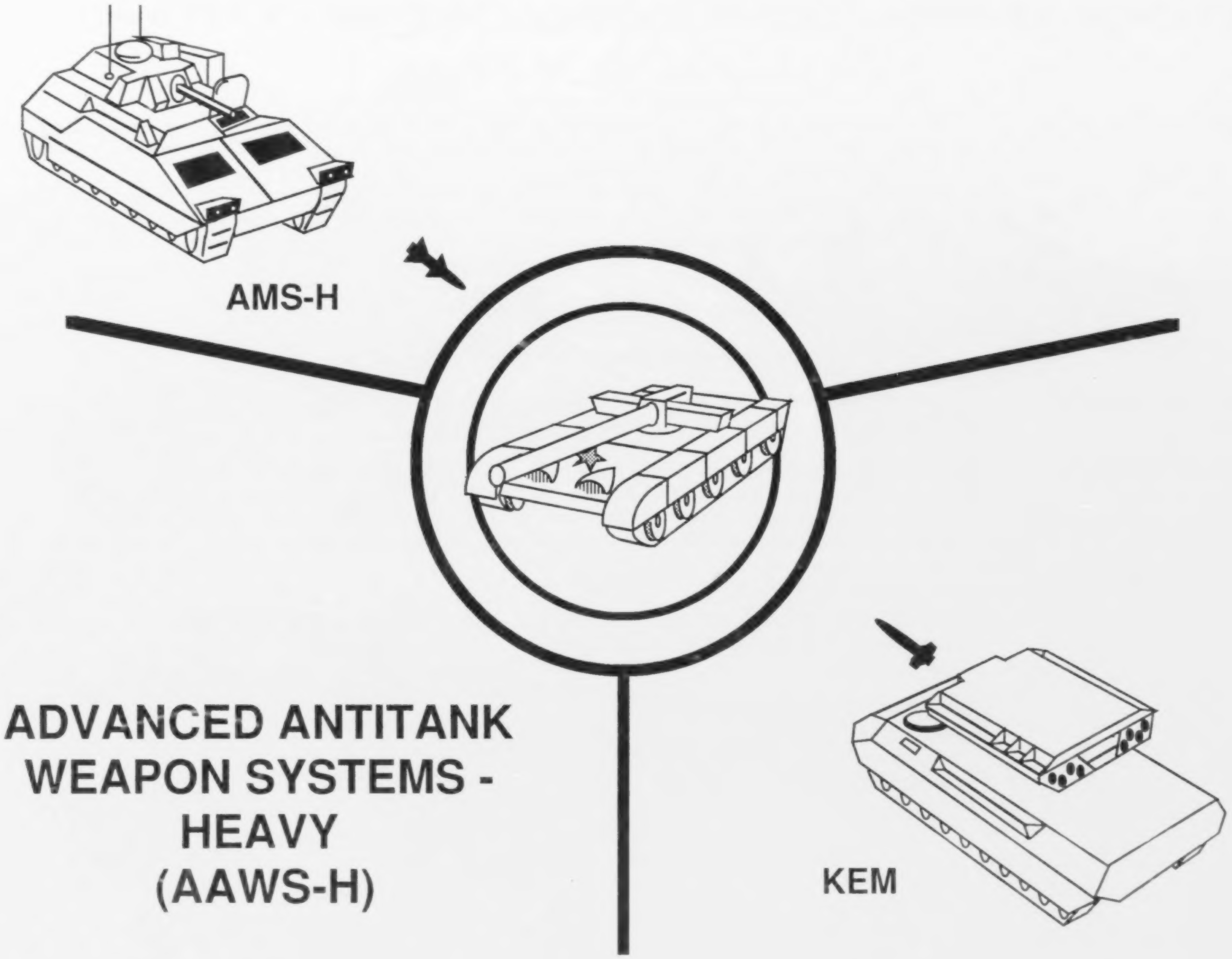
Proof-of-Principle Contractors

Ford Aerospace and Communications Corp. (Newport Beach, CA) - Laser Beam Rider Technology
Hughes Aircraft Co. (Canoga Park, CA) - Fiber Optic Guidance Technology
Texas Instruments, Inc. (Dallas, TX) - Imaging Infrared Seeker Technology

Full Scale Development Teams

Ford Aerospace and Communications Corp. - General Dynamics Corp.
Hughes Aircraft Co. - Honeywell, Inc.
Texas Instruments, Inc. - Martin Marietta Corp.

ADVANCED ANTITANK WEAPON SYSTEMS - HEAVY (AAWS-H)



H881102-1

Advanced Antitank Weapon System-Heavy (AAWS-H)

MISSION:

The Advanced Antitank Weapon System - Heavy (AAWS-H) will be a crew served TOW replacement weapon employed by both heavy and light forces to provide stand-off and overmatch to defeat the current and projected Soviet Armor threat. AAWS-H is a family of weapons consisting of an Advanced Missile System — Heavy (AMS-H) and a Kinetic Energy Missile (KEM) System. The KEM will be developed as a Line-of-Sight Antitank replacement fcr the M901 ITV vehicle (dedicated heavy antitank system); the AMS-H will be deployed in the light, airborne and air assault forces and mechanized rifle companies by maintaining war fighting capabilities of the Bradley Fighting Vehicle, High Mobility Multipurpose Wheeled Vehicle (HMMWV), and potentially the Cobra attack helicopter. (There are multiple candidate technologies under development or currently planned for development which will guide the AMS-H missile to its target). The systems will be capable of operating in day, night, through battlefield obscurants, as well as in a countermeasure environment.

CHARACTERISTICS:

	AMS-H	KEM
Weight:	TBD	170 lbs
Length:	TBD	110 lbs
Diameter:	TBD	6.4 in
Range:	Greater than TOW	Greater than TOW
Crew:	4 or less	4 or Less

PROGRAM STATUS:

The AAWS-H Program is in the pre-Full Scale Engineering Development (FSED) phase.

Kinetic Energy Missile (KEM): The Hypervelocity Missile (HVM) Joint Service Program Demo (Army/Air Force/Marine Corps), which is demonstrating the basic concept for KEM, began early in 1985 and is to be completed 2nd quarter, FY89. An accelerated KEM prototype development program that will build upon the HVM Demo was approved in August 1988.

Advanced Missile System — Heavy (AMS-H): A Request for Proposal (RFP) was released September 1988 for the Imaging Infrared (IIR) Seeker Technical Demonstration.

KEM and AMS-H: A Milestone II Decision Review for entering FSED is planned for 4th Qtr, FY90.

CONTRACTORS:

Joint Services HVM - LTV, Dallas, TX
Other TBD

Lightweight Multipurpose Weapon (AT4)

MISSION:

The AT4 is the Army's new Lightweight Multipurpose Weapon and supplements the M72 LAW. The AT4 is a shoulder fired recoilless weapon used against light armor and materiel targets. The system incorporates a disposable launcher and a cartridge case containing a fin stabilized high explosive shaped charge projectile. The AT4's accuracy, lethality and range (over 300 meters) are considerably greater than the M72 LAW's.

CHARACTERISTICS:

Weight:	14.6 lbs
Length:	39.7 inches
Range:	300 + meters
Caliber:	84mm
Sights:	Front post/rear peep similar to M16
Storage Life:	20 years

SOVIET COUNTERPART:

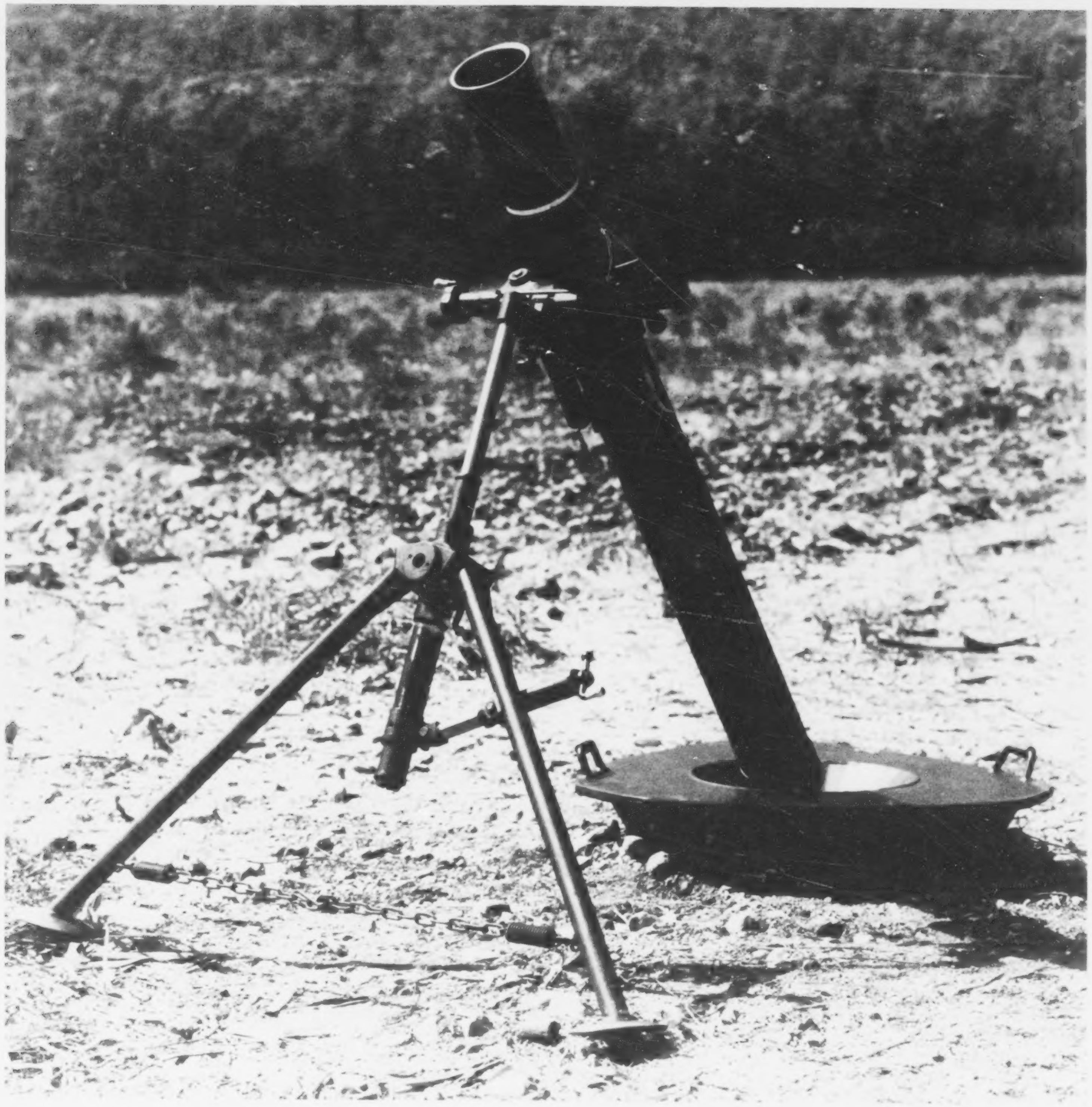
The RPG 22 probably has performance characteristics similar to the AT4 and is probably the latest fielded RPG series of weapons.

PROGRAM STATUS:

Fielding of the system is underway. Initial purchases were procured from Sweden. The Army has signed a contract with Honeywell, Inc. to produce AT4's on shore in FY88. First delivery from onshore production is scheduled for July 1989. The Marine Corps and the Navy are also buying this weapon.

CONTRACTORS:

FFV of Sweden is the current producer with Honeywell (Minnetonka, MN) as their US licensed representative. Honeywell will use Joliet Army Ammunition Plant (Joliet, IL) for domestic production.



120 MM Mortar

MISSION:

The 120mm Mortar is a nondevelopmental system from Israel. The weapon is a conventional, smoothbore, muzzle-loaded mortar and will be employed in both towed and carrier-mounted versions. The 120mm Mortar will replace the current 4.2-inch mortar in heavy divisions and will fire a new family of enhanced ammunition currently in development. The 120mm Mortar will provide increased range and improved transportability, effectiveness, and standardization.

CHARACTERISTICS:

Range:	7,240 meters
Weight:	317 lbs (ground-mounted)
Rate of Fire:	4 rounds per minute, sustained
Crew:	4
Ammunition:	HE, Smoke, Illumination

SOVIET COUNTERPART:

The nearest Soviet counterpart is the M43 120mm Mortar. Its range is 5,700 meters, it weighs 602 pounds, and has a 6-man crew. It is fielded in the Soviet, Warsaw Pact, and other armies.

PROGRAM STATUS:

The weapon and a family of nondevelopmental ammunition is currently undergoing Operational Testing for type classification during 1989, and initial fielding during 1990. A family of enhanced ammunition, including HE, Smoke, and Illumination cartridges, is currently under development. All production will be in the U.S. except for initial fielding quantities.

CONTRACTORS:

Martin Marietta Ordnance Systems, MD
Watervliet Arsenal, NY

Squad Automatic Weapon (M249)

MISSION:

The Squad Automatic Weapon provides a lightweight, one-man-portable machine gun capable of delivering a large volume of effective fire for infantry squads. This role was filled during World War II and Korea by the Browning Automatic Rifle, during the 1960's by the M14A1 Rifle, and during the 1970's by the M16A1 Rifle. For this role, the M16A1 was equipped with a bipod and fired in the automatic mode. There are two and three M249's in Army and Marine Corps Infantry squads, respectively. Acquisition is also expected by the Air Force and Navy. Modifications are being made to the weapon to enhance soldier-weapon interface.

CHARACTERISTICS:

Caliber:	5.56mm
Weight:	16.3 lbs
Rate of Fire:	750 rds/min
Range:	800 meters
Magazine Capacity:	200 rds

SOVIET COUNTERPART:

The closest Soviet equivalent systems are the 7.62mm PKM and the 5.45mm RPK 74 which are fielded with Soviet and Warsaw Pact nations.

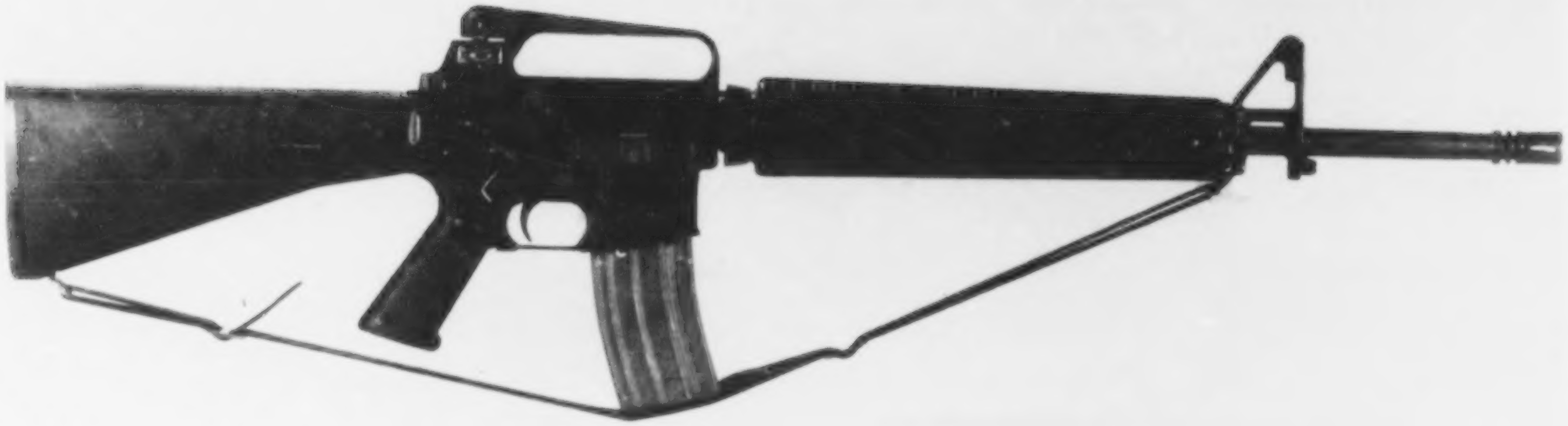
	PKM	RPK74
Caliber:	7.62mm	5.45mm
Weight:	18.5 lbs	11 lbs
Rate of Fire:	650 rds/min	600 rds/min
Range:	1000 meters	800 meters
Magazine Capacity:	100 rds	75 rds

PROGRAM STATUS:

Fielding of the M249 started in FY84. Improvements recommended by users have been successfully tested and approved. These changes have been incorporated into the current 5-year, multiyear, competitively selected, firm fixed price contract awarded in September 1988.

CONTRACTOR:

CONUS procurement began with a contract awarded to FN Manufacturing Inc. (Columbia, S.C.) in September 1988.



M16 A2 RIFLE

M16A2 Rifle

MISSION: The M16A2 is an improved version of the M16A1 and is being issued to front line combat soldiers as the Army's primary combat rifle. The M16A2 is a lightweight, air-cooled, gas operated, low impulse rifle. It incorporates improvements in sight, pistol grip, stock and overall combat effectiveness. Accuracy is improved firing by incorporating an improved muzzle compensator, three round burst control, a heavier barrel and by using the heavier NATO standard ammunition which is also fired by the Squad Automatic Weapon.

CHARACTERISTICS:

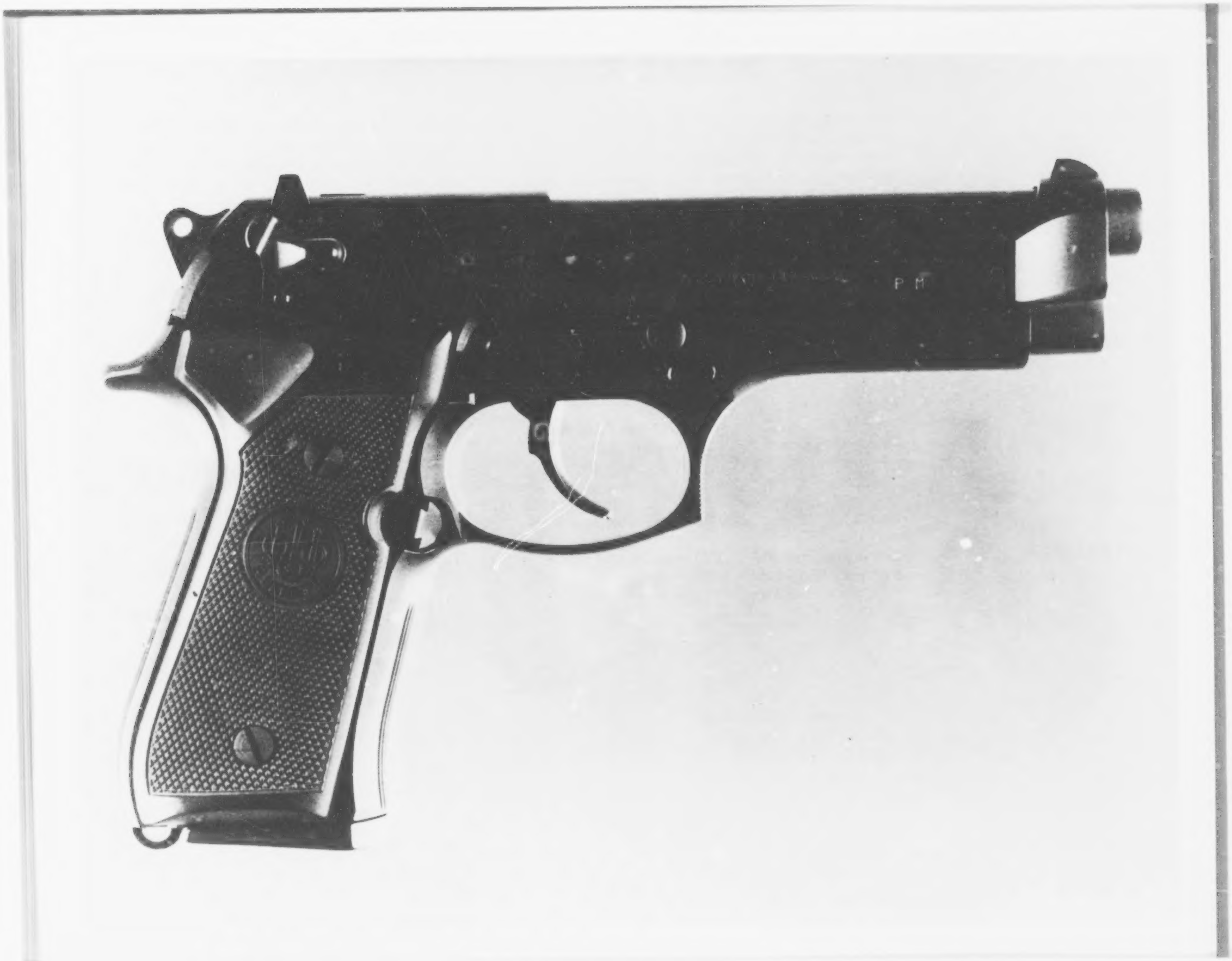
Caliber:	5.56mm
Weight:	8.9 lbs
Range:	550 meters
Type of fire:	Semi-automatic, three round burst
Magazine capacity:	30 rounds

SOVIET COUNTERPART: The 5.45mm AK-74 Assault Rifle is currently in service in Soviet and some Warsaw Pact forces.

Caliber:	5.45mm
Weight:	7.9 lbs
Range:	400 meters
Type of fire:	Semi-automatic, automatic
Magazine capacity:	30 rounds

PROGRAM STATUS: The Army First Unit Equipped (FUE) occurred in January 1987 and to date, approximately 184,000 weapons have been fielded. Some M16A1 rifles will be converted to M16A2 rifles during depot overhaul using modification kits. A 5-multiyear, competitively selected, firm fixed price contract was awarded in September 1988.

CONTRACTOR: Colt Industries (Hartford, CT) began original production in June 1983. Current contractor is FN Manufacturing Incorporated (Columbia, S.C.)


P M

M9 9MM Personal Defense Weapon

MISSION:

The 9mm pistol is the standard replacement weapon for the caliber M1911A1 .45 caliber pistol and various caliber .38 revolvers currently used by the Department of Defense. The 9mm is a semiautomatic double-action pistol that is more lethal, lighter, and safer than the .45 caliber pistol. It can be used effectively by either right or left handed shooters. The weapon will be issued to individuals who are not riflemen, or who are not issued rifles for personal defense, for law enforcement personnel, close quarter requirements, and aviators. The 9mm pistol is a Joint Service Program/which provides a weapon capable of firing NATO standard 9mm ammunition.

CHARACTERISTICS:

Caliber:	9mm
Weight (Loaded):	2.6 lbs (fully loaded)
Range:	50-100 meters
Trigger action:	Double
Magazine capacity:	15 rounds

SOVIET COUNTERPART:

The 9mm Makarov is the standard pistol for the Soviet forces and for most of the countries in the Warsaw Pact. It is a copy of the Walther PP in general size, shape and handling.

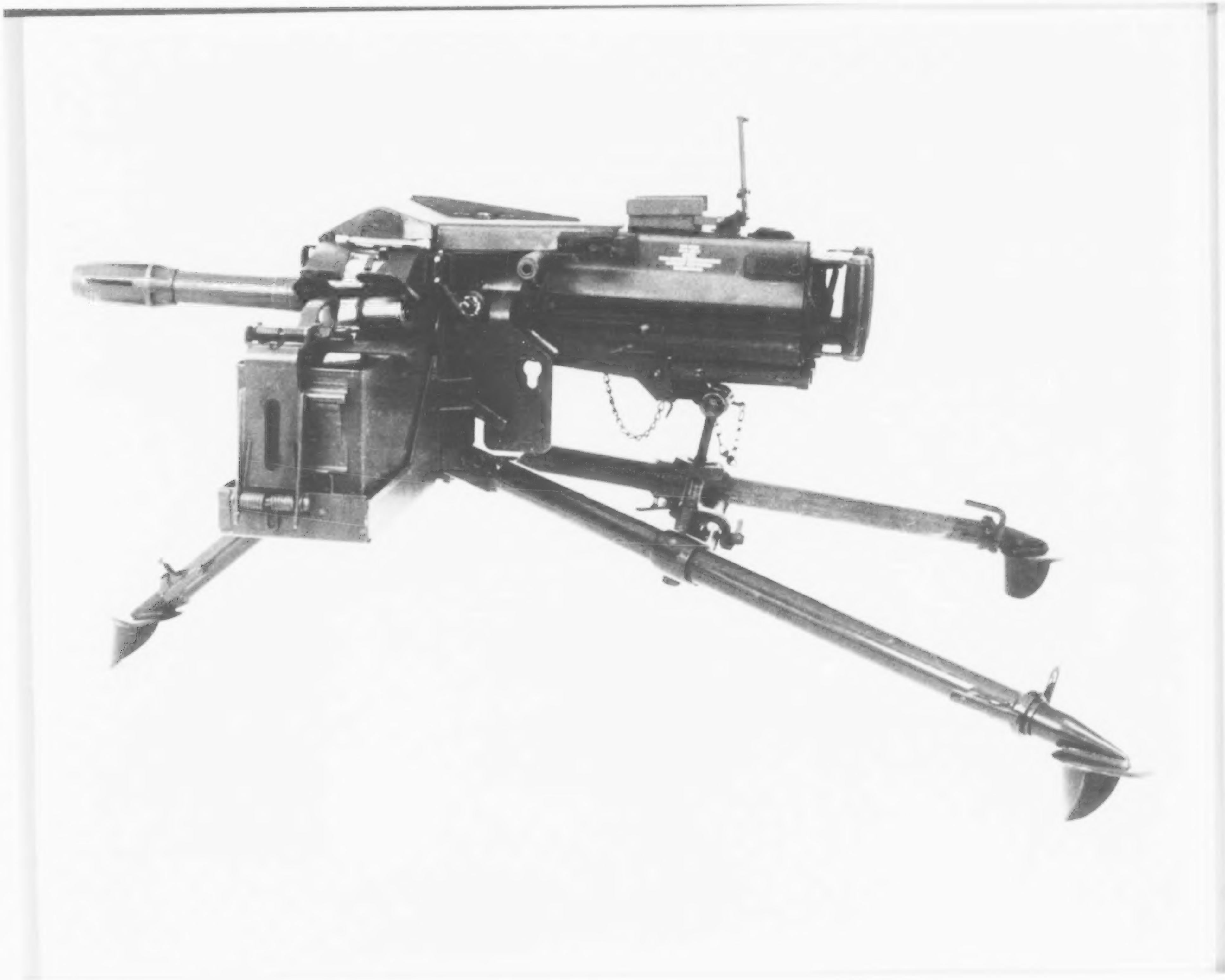
Caliber:	9mm
Weight:	1.8 lbs
Range:	50 meters
Trigger action:	Double
Magazine capacity:	8 rounds

PROGRAM STATUS:

The 9mm Personal Defense Weapon is being produced for the Joint Services. An initial five year, multiyear firm fixed price (FFP) contract was awarded in April 1985 for 315,930 weapons. As of September 1988, more than 140,000 pistols have been delivered. A follow-on competition is ongoing which will lead to an award of a 3-year, FFP contract for 142,292 weapons plus spares in 3rd Qtr, FY89.

CONTRACTOR:

Beretta, USA. (Accokeek, MD)



MK19-3 40MM Automatic Grenade Launcher

MISSION:

The MK19-3 will be used in offensive and defensive operations against personnel and light-armored vehicles. It will be used in the main battle area by all types of combat infantry units and by combat support and combat service support units to conduct rear area security missions. The MK19-3 will be mounted on M151 ¼ton trucks, M113 Armored Personnel Carriers, High Mobility Multi-Purpose Wheeled Vehicles (HMMWV), selected cargo trucks, and the M88A1 Medium Recovery Vehicle.

CHARACTERISTICS:

Caliber:	40mm
Weight:	72.5 lbs
Rate of fire:	325-375 rds/min
Max effective range:	1500 meters (point targets); 2200 meters (area targets)
Lethality:	Anti-personnel—5 meters (Expected Casualty Radius) Anti-armor—2.0 inches penetration to maximum range of 2200M

SOVIET COUNTERPART:

The Soviet 30-mm AGS-17 automatic grenade launcher was developed as a result of the fielding of the US 40mm MK19 Mod O machine gun, which saw extensive service in Vietnam.

Caliber:	30mm
Weight:	37 lbs
Rate of fire:	100-400 rds/min
Max effective range:	1200 meters; max range is 1700 meters

PROGRAM STATUS:

The MK19-3 was developed and approved for Service use by the Navy in 1981. The Army type classified the MK19-3 as standard "A" January 1986. Initial procurement of MK19-3 for the 9th Infantry Division was contracted for by the Navy in October 1983. The Army assumed program management responsibilities from the Navy in FY88. A new competitive multiyear contract was awarded in December 1988.

CONTRACTOR:

SACO Defense Inc. (Saco, Maine).

120MM Tank Main Gun Ammunition

MISSION:

The 120mm family of tank ammunition supports the main gun on the M1A1 tank and is fired from the smoothbore M256 cannon. The 120mm munitions are comprised of four cartridges - a kinetic energy Armor Piercing Fin Stabilized Discarding Sabot-Tracer (APFSDS-T) round, a chemical energy High Explosive Anti-Tank (HEAT) round and training counterparts for each. This development program represents a successful effort to transfer the Leopard II cannon and munitions technology. The fielding of the 120mm tank weapons system complements the current fleet of 105mm tanks and provides a significant increase in the Army's armor combat capability.

CHARACTERISTICS:

M829 - Armor Piercing Fin Stabilized Discarding Sabot with Tracer (APFSDS-T) - Combustible cartridge case; one piece depleted uranium penetrator; discarding aluminum sabot.

M830 - High Explosive Anti-Tank Multi-Purpose with Tracer (HEAT-MP-T) - Combustible cartridge case; multi-action fuzing; shaped charge warhead.

M865 - Target Practice Cone Stabilized Discarding Sabot with Tracer (TPCSDS-T) - Combustible cartridge case; limited range; training counterpart for APFSDS-T.

M831 - Target Practice with Tracer (TP-T) - Combustible cartridge case; inert warhead; training counterpart for HEAT-MP-T.

SOVIET COUNTERPART:

The Soviet armor forces have available armor piercing fin stabilized, high explosive antitank, and high explosive fragmentation munitions.

PROGRAM STATUS:

Production has been scheduled to meet fielding requirements and support various testing programs. The two service rounds are being shipped in metal cans. Honeywell Inc. (Minneapolis, MN) was the sole source systems contractor for the first three years (FY 84-FY 86) production. General Defense Corporation (Red Lion, PA) was the winner of a second source competition with General Electric (Burlington, VT). For FY87, General Defense had approximately 20% of the production quantity; Honeywell had the balance. Since FY88, Honeywell and General Defense have competed head-to-head.

CONTRACTORS:

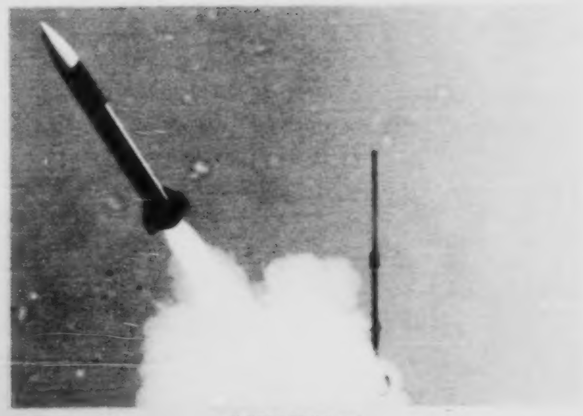
Honeywell, Inc. (Minnetonka, MN)
General Defense Corp. (Red Lion, PA)
Aerojet Ordnance (Jonesboro, TN)
Mason and Hanger (Middletown, IA)
NI Industries, Inc. (Concord, MA)
Valentec Int'l. (Costa Mesa, CA)
ARMTEC Defense Products (Coachella, CA)
Bulova Systems (Valley Stream, NY)
Hercules Inc. (Radford, VA)
Nuclear Metals, Inc. (Concord, MA)
Chamberlain Mfg. Corp. (Waterloo, IA)
Hamilton Technology, Inc. (Lancaster, PA)

The Air Defense mission area relates to the detection and engagement of the air threat with ground fire systems. Air defense systems must protect all ground forces elements including troop formations, depots, lines of communication, air bases, key command and control facilities, and other vital assets.

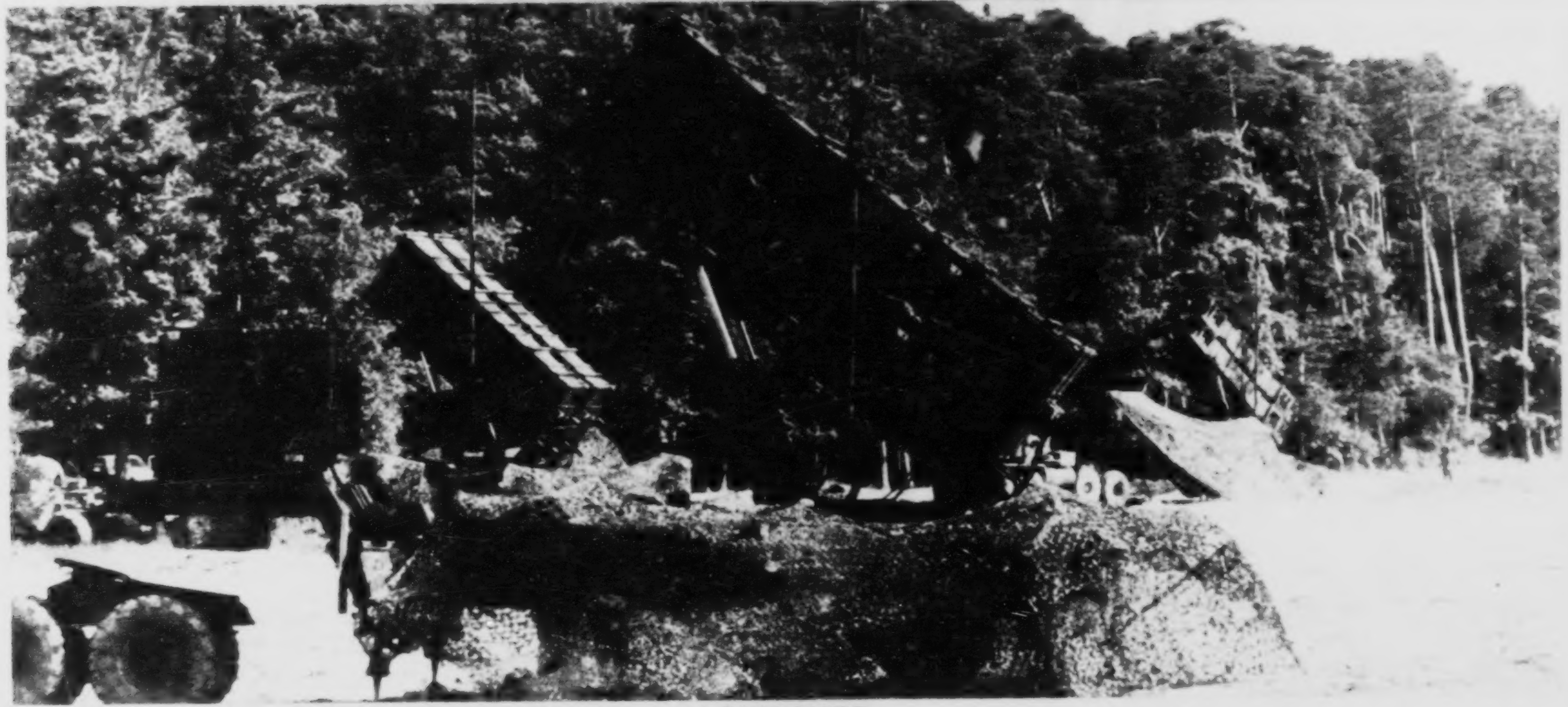
AIR DEFENSE

PATRIOT

RADAR



MISSILE



LAUNCHER

PATRIOT

MISSION:

The PATRIOT air defense system is the centerpiece of theater air defense. The system's fast reaction capability, high firepower, and ability to operate in a severe electronic countermeasure environment are features not previously available in the systems PATRIOT will replace. The PATRIOT design eases the field logistic burden since its overall performance is achieved with less equipment, less operational manpower and fewer repair parts than previous systems. The combat element of the system is the fire unit which consists of a radar set, an engagement control station, a power plant, Antenna Mast Group (AMG) and eight remotely located launchers. The system is highly automated combining high-speed digital processing with various software routines to effectively control the battlespace. The single radar, using phased array technology, provides for all tactical functions of airspace surveillance, target detection and track, and support of missile guidance. The only manned element of the fire unit during air battle, the engagement control station, provides the human interface for control of automated operations. Each launcher contains four ready-to-fire missiles, sealed in canisters, which serve a dual purpose as shipping containers and launch tubes.

CHARACTERISTICS:

Guidance:	Command/Track-Via-Missile
Engagement:	Multiple Targets Simultaneously

SOVIET COUNTERPART:

The Soviets have several missile systems, including the SA-1, SA-2, SA-4, SA-5, SA-10, and SA-12, that are used to attack aircraft in the regime for which PATRIOT was designed. Only the SA-10 and SA-12 are considered as advanced or effective as PATRIOT.

PROGRAM STATUS:

PATRIOT is in its tenth year of production and was initially deployed to Europe in 1985. Nine battalions are currently operational with one additional battalion scheduled to join our forces during the next two years. Germany, Holland and Italy are currently participating in PATRIOT acquisition programs to provide for cooperative air defense improvements. The first NATO unit was delivered in 1986 and discussions continue with other interested NATO allies. Additionally, Japan has been licensed for the production of 26 fire units.

CONTRACTORS:

Raytheon Company (Bedford, MA)
Martin Marietta Corporation (Orlando, FL)

HAWK

High Power Illuminator

Continuous Wave Acquisition Radar

Launcher

HAWK

MISSION:

HAWK is a medium-range air defense guided missile system designed to provide air defense protection against low to medium altitude air attack. First fielded in 1960, it is a mobile, all weather, missile system providing vital air defense for critical installations and maneuver forces. HAWK is highly lethal, reliable and effective in the electronic countermeasures environment of the modern battlefield. HAWK units are being reorganized into a more streamlined and efficient fighting organization. Each firing platoon is comprised of a platoon command post, an acquisiton radar, a tracking radar, an optical tracking system, an IFF (Identification, Friend or Foe) system, and three or four launchers each with three missiles. The Hawk missile is guided by reflected radar energy and uses a proximity fuze to detonate its highly lethal warhead. Hawk's latest product improvement (PIP III) will provide a low-altitude, simultaneous engagement capability and enhanced electronic counter-countermeasures.

SOVIET COUNTERPART:

The Soviet SA-6 is somewhat similar to Hawk. Its range and altitude capabilities (30 km and 10 km, respectively) are less than that of the HAWK, but the SA-6 is more mobile. The basic SA-6 unit is a regiment which includes five missile batteries. Each missile battery contains a target acquisiton and fire control radar called "STRAIGHT FLUSH" and 4 Transporter Erector Launchers (TEL). Each TEL carries 3 ready-to-fire missiles.

PROGRAM STATUS:

HAWK is deployed worldwide with the Army, Marines, NATO, and numerous other nations. HAWK modernization is continuing with the procurement of the third in a series of product improvements that will further enhance the firepower, reliability, and combat effectiveness of the system. The Army will begin fielding of PIP III systems in FY89. A program to enhance the system's mobility has been initiated as a cooperative development between the U.S. Army, the Netherlands, and the U.S. Marine Corps.

CONTRACTORS:

Raytheon Company (West Andover, MA)
Aerojet (Sacramento, CA)
Westinghouse Electric Corp (Baltimore, MD)
Northrop Corp (Anaheim, CA)
ICSD (Hauppauge, NY)
DBA (Kissimme, FL)
General Electric (Huntsville, AL)

Chaparral

MISSION:

Chaparral is the Army's short-range air defense (SHORAD) surface-to-air missile system. It is effective against all types of aircraft at low altitudes and provides protection for corps, theater rear areas and, currently, division areas. Chaparral is a self-propelled system. Its tracked carrier provides excellent cross-country mobility. The launch station can be removed from the carrier and operated from a ground emplacement. It is equipped with a Forward Looking Infrared Subsystem that provides day/night and adverse weather capability and extends system acquisition range. The missile is lightweight, supersonic, fire-and-forget, with an all aspect passive infrared homing guidance system capable of engaging both approaching and receding targets.To enhance missile acquisition range and infrared countermeasure rejection capability the Rosette Scan Seeker guidance section has been developed. To reduce rocket motor smoke, a smokeless motor has been developed and is being retrofitted to inventory missiles upon shelf-life expiration of the current "smoky" motors. To assist the gunner in identifying targets as friendly, Chaparral has an Identification Friend-or-Foe (IFF) subsystem. Noncooperative target recognition subsystems are being examined to enhance this capability. Chaparral carries four ready missiles on launch rails and eight additional missiles in storage compartments. Chaparral, which was initially fielded in 1969, is continually being improved and will remain in the inventory into the 21st century.

CHARACTERISTICS:

Crew: Four
Guidance: Infrared Homing, Fire and Forget
Warhead: Blast-fragmentation
Fuze: RF directional doppler

SOVIET COUNTERPART:

The SA-9 and SA-13, introduced in late 1960's and 1970's respectively, are the counterparts to Chaparral. They have approximately the same range and also use an infrared homing guidance system. The SA-9 is mounted on a two-axle amphibious vehicle; the SA-13 is on an MTLB tracked vehicle.

PROGRAM STATUS:

The initial contract for production of the improved Rosette Scan Guidance Section was awarded competitively to Hughes Aircraft Company in September 1988. The contract is for guidance sections for 122 new missiles, retrofit of 574 missiles and 28 spares. It is planned to award a production contract in FY89 for guidance sections for 368 new missiles and retrofit of 48 missiles.

CONTRACTOR:

Ford Aerospace Corp. (Newport Beach, CA) - System Development
Hughes Aircraft Co. (Tucson, AZ) - RSS GS Production

Forward Area Air Defense System (FAADS)

MISSION: The cancellation of the DIVAD program resulted in major reassessment of air defense requirements in the Forward Area. The lessons learned from the DIVAD experience proved that one weapon alone, or even multiple weapons acting independently, cannot defeat the air threat. FAADS is an integrated program of complementary systems which will provide Army Divisions with dedicated Air Defense Artillery (ADA) and integrated Joint and Combined Arms. Ongoing Army programs are being combined with new technology to integrate weapons, sensors, and a command, control and intelligence architecture into a system optimized to counter the entire spectrum of the air threat to the forward area through the 1990's and beyond. The FAADS concept is designed to provide total coverage in the division area and permits the enemy no preferred attack option. The strategy relies heavily on nondevelopmental items (NDI) and preplanned product improvements (P^3I) to rapidly overcome our current air defense deficiencies and keep pace with the advancing threat.

CHARACTERISTICS/ PROGRAM STATUS: FAADS consists of five components: Line of Sight-Forward; Line of Sight-Rear (the Pedestal Mounted Stinger); Non-Line of Sight (the Fiber Optic Guided-Missile); FAAD Command, Control and Intelligence, and Combined Arms Initiatives. Line of Sight-Forward-Heavy (LOS-F-H) is a hybrid missile/gun system on an armored, tracked vehicle. Its mission is to counter the fixed wing air threat and provide long range anti-helicopter fires as it maneuvers with heavy division's Combined Arms Team in the close combat fight. After extensive testing in an intense countermeasures environment, Martin Marietta's ADATS was selected for the LOS-F-H role. The Army plans to buy a total of 562 systems with the First Unit Equipped (FUE) in FY92. Line of Sight-Rear (LOS-R) is a missile/gun system mounted on the HMMWV. Also known as Pedestal Mounted Stinger (PMS), this system uses the proven Stinger missile and a .50-caliber machine gun. LOS-R provides a weighted, area defense against the air threat to the brigade and division rear areas. Boeing's AVENGER, selected to perform this role, provides a shoot-on-the-move, soldier friendly solution to the LOS-R requirements. The First Unit Equipped (FUE) for AVENGER is FY89 and a procurement of 1,207 fire units is planned. Non-Line of Sight (NLOS) is the Fiber Optic Guided-Missile (FOG-M). This system provides a long range anti-helicopter, anti-tank system that can defeat targets beyond the range of line of sight systems and targets masked by terrain. A Full Scale Development contract is expected in December 1988. First Unit Equipped is scheduled for 4th Qtr, FY93 and a total procurement of 403 systems is currently planned. FAAD Command, Control, and Intelligence (FAAD C2I) integrates FAADS components into a synergistic system of systems by providing rapid and reliable (1) targeting; (2) air situation; and (3) air battle management information. FAAD C2I will assist in planning, directing, coordinating, and controlling the FAAD fight. FAAD C2I consists of four separate but interrelated efforts: Command & Control (C2) Hardware and Software, Ground Based Sensor, Mass Target Sensors, and Positive Hostile Identification equipment. FAAD C2I's Command and Control, Ground Based Sensor and one of the passive identification components are scheduled for initial fielding in FY93. Combined Arms Initiative (CAI) provide ground and aerial combat elements an enhanced capability for self defense against enemy helicopters. Air-to-Air Stinger is in production for the OH-58C/D. The Bradley Fighting Vehicle sight reticle enhancement was cut into the BFV production line in May 1987. Engineering development continues on providing 120mm tank ammunition an anti-helicopter capability.

SOVIET COUNTERPART: The Soviets have continued to deploy numerous Air Defense Systems in the Forward Area of the battlefield including the ZS6, ZSU-23/4, SA-8, SA-9, and continue to deploy and improve a robust integrated Air Defense Command, Control and Intelligence System.

CONTRACTORS:

LOS-F-H (ADATS)—Martin Marietta (Orlando, FL)
NLOS (FOG-M)—Boeing Aerospace (Huntsville) and Hughes Aircraft Co (Canoga Park, CA)
FAAD C2 SOFTWARE—TRW (Redondo Beach, CA)
LOS-R (PMS)—Boeing Aerospace (Huntsville, AL)
FAAD GROUND BASED SENSOR—TBD

Stinger

MISSION:

Stinger is a shoulder-fired, infrared homing missile system whose mission is to provide air defense coverage to combat units. The missile homes on the heat emitted by either jet or propeller-driven fixed-wing aircraft or helicopters, and employs a proportional navigation system that allows it to fly an intercept course to the target. A Stinger crew visually acquires its target and electronically interrogates it to help determine if it is a friend. The missile notifies the gunner when it has a "lock" on the target. After trigger pull the Stinger is then ejected from the tube by a small launch motor. Once the missile has traveled a safe distance from the gunner, its main engine ignites and propels it to the target. Stinger is stored in a sealed tube, requires no maintenance in the field, and is designed to withstand the rigors of the battlefield. It is replacing the Redeye system. It can attack much faster targets than Redeye, and most importantly, can destroy aircraft from any aspect. A follow-on seeker (Stinger-POST) improves the capability of the system in certain infrared countermeasures environments. Stinger-Reprogramable Microprocessor (RMP) further enhances the performance in infrared countermeasures environments and provides the capability to make future changes to the missile as the threat evolves through a replaceable software module.

SOVIET COUNTERPART:

Soviet Manportable Air Defense Systems are the SA-7, comparable to the U.S. Redeye, and the SA-14. The SA-7 has a range and altitude capability of approximately 3 km and only a tail chase capability. The SA-7 was used extensively in Vietnam and the Middle East and is deployed with the maneuver units throughout the Warsaw Pact. The SA-14, fielded in the late 1970's, has similar performance characteristics to the Stinger. The SA-14 is replacing the SA-7. The SA-16, fielded in the 1980's, is replacing the SA-14.

PROGRAM STATUS:

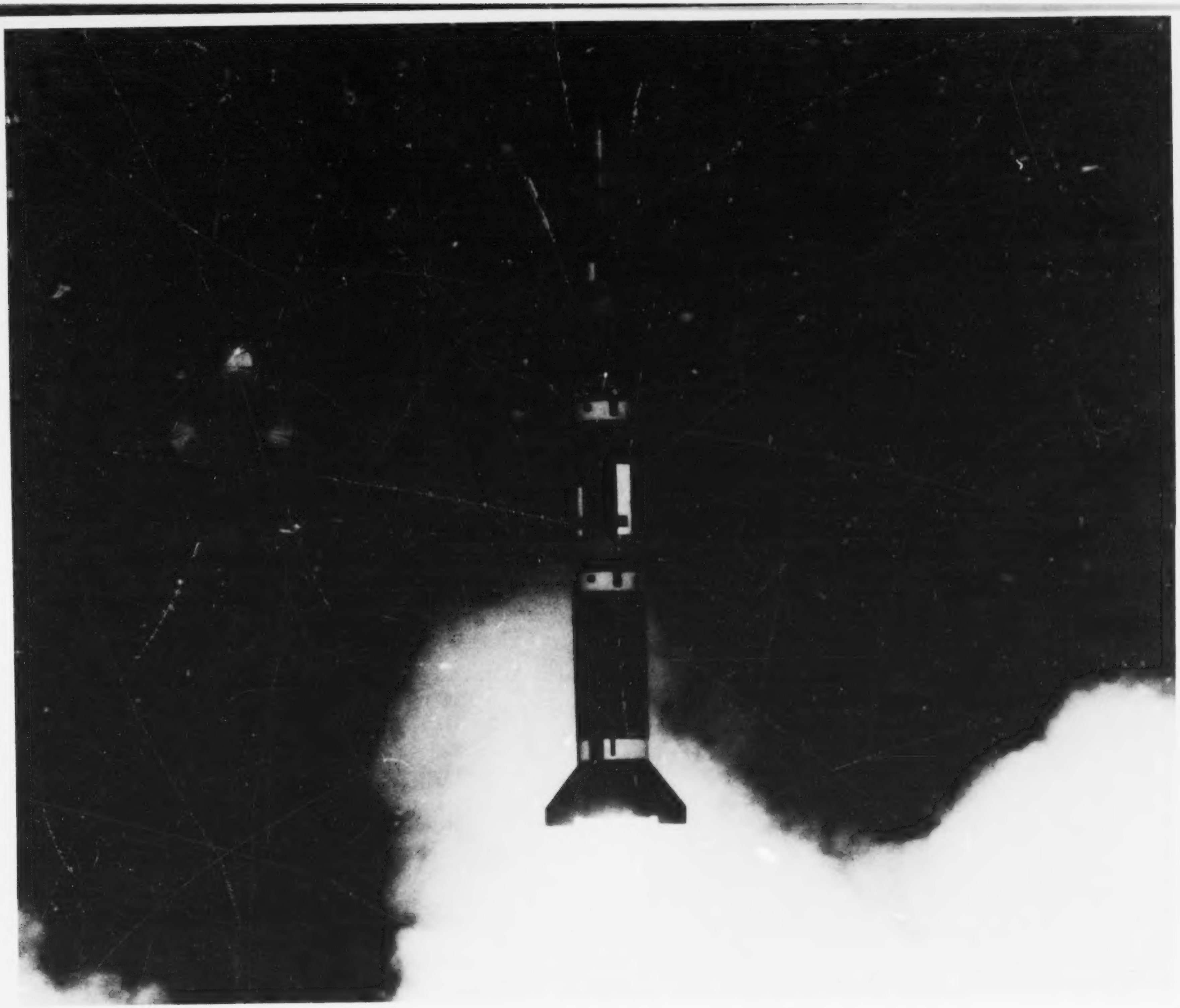
Basic Stinger was operationally deployed to Germany in 1981 and to the 82nd Airborne Division in 1982. Basic Stinger production has been completed. Stinger-POST entered production in FY83, first deliveries were made in September 1986, and production was completed in August 1987. Stinger-POST missiles were deployed in FY87. Stinger-RMP entered development in September 1984, transition to production began in November 1985, and initial deliveries will be made in FY89. Plans call for future Stinger missiles to be RMP configured.

CONTRACTORS:

General Dynamics Valley Systems Division (Ontario, CA) (Prime)
Raytheon (Lowell, MA)(Second Source).

The Fire Support mission area includes those systems directly related to the generation of indirect firepower. This mission area includes not only conventional, nuclear, and chemical fire support provided by cannons, rockets, and missile systems, but also the target acquisition and communication systems integral to field artillery operations.

FIRE SUPPORT



Pershing II Missile System

MISSION:

Pershing II is a modular, evolutionary improvement to the previously fielded Pershing 1A ballistic missile. PII provides a tenfold accuracy improvement over the PIA and provides more than twice the range (1800 km). The accuracy improvement is achieved by a technique called Radar Area Correlation. As the Pershing II reentry vehicle descends in the area of the target, it compares live radar reflection from the target area with reference scenes stored prior to launch. It then makes course adjustments based on the comparisons, producing almost pinpoint accuracy, and hence allowing the use of smaller nuclear warheads that produce less unwanted collateral damage. Pershing II also incorporates several other features that enhance its flexibility and decrease its operating costs. Pershing II is part of an appropriate response to the Soviet deployment of the SS-20, a system that threatens virtually all installations and cities in western Europe. The Pershing system is truck mounted, highly mobile, and rapid reacting, and as such is a survivable and powerful part of the tactical nuclear force in Europe.

CHARACTERISTICS:

Propulsion: Solid two-stage
Warhead: Nuclear

SOVIET COUNTERPART:

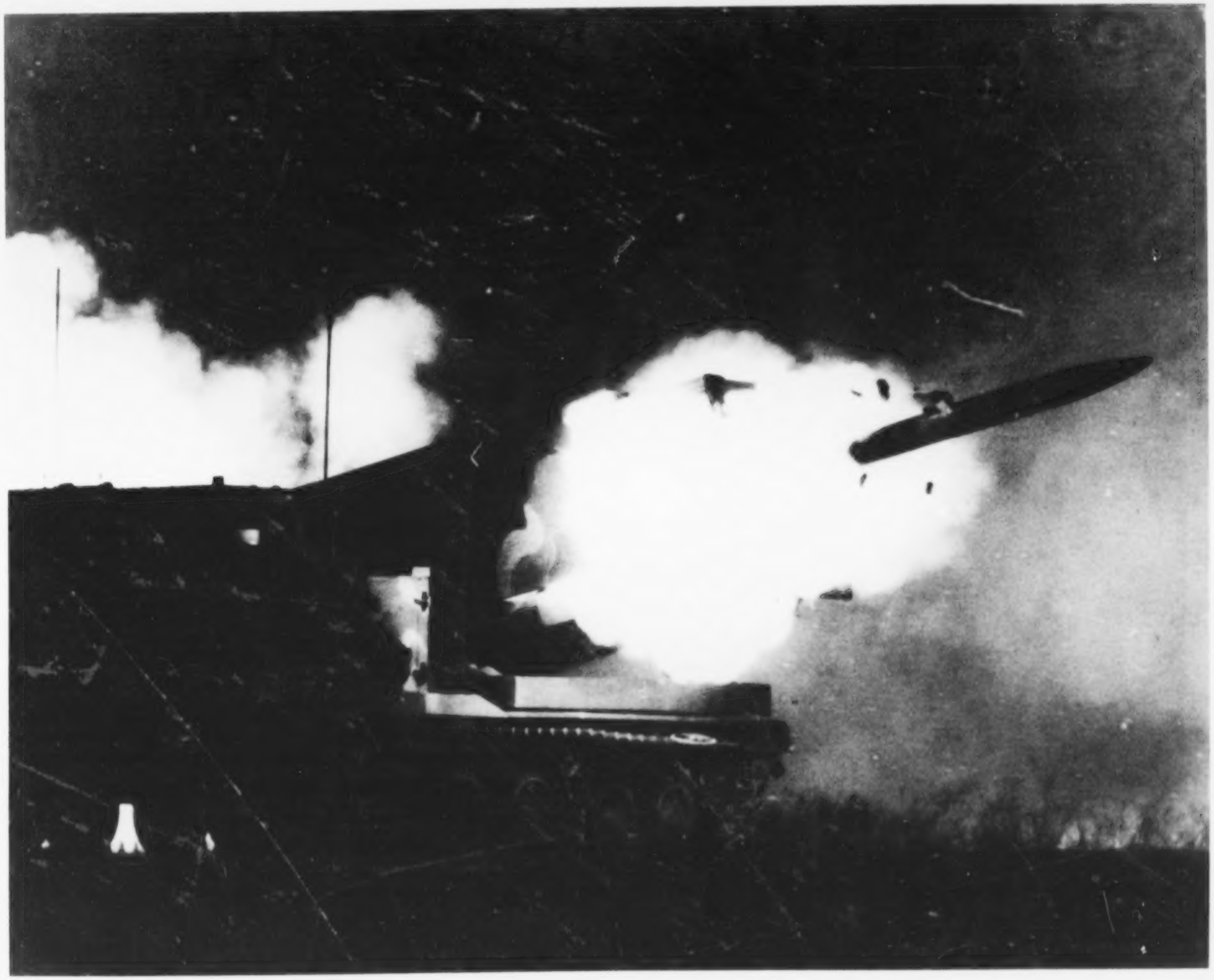
The SS-20, a mobile intermediate-range ballistic missile (IRBM). It is configured to carry three MIRV's and has a range of close to 5000 km. It does not, however, have the accuracy afforded by the Pershing II system Radar Area Correlation Guidance.

PROGRAM STATUS:

Pershing II completed tactical deployment Final Operational Capability (FOC) in Europe on schedule in December 1985 and completion of final approved missile production occurred in late 1987. The PII missile system is one of the U.S. systems identified for elimination during intermediate range nuclear forces (INF) treaty negotiations with the Soviet Union. PII missile and launcher eliminations are currently underway, however, all PII systems will not be withdrawn from deployed status until 1991.

CONTRACTOR:

Martin Marietta (Orlando, FL)
Loral Corporation (Akron, OH)
Singer Co., Kearfott Division (Little Falls, NJ)
Bendix Corp. (Teterboro, NJ)
Hercules Inc. (Salt Lake City, UT)



Multiple Launch Rocket System (MLRS)

MISSION:

The MLRS is a free-flight, area fire, artillery rocket system being fielded to fill an existing void in conventional fire support. The primary missions of MLRS are counterfire and suppression of enemy air defenses. MLRS supplements cannon artillery fires by delivering large volumes of firepower in a short time against critical, time-sensitive targets. The basic warhead carries improved conventional submunitions. Germany, one of five partners in an international development program, is developing a scatterable mine warhead. Growth potential exists to add a Terminal Guidance Warhead (TGW) to defeat armor, a Sense and Destroy Armor (SADARM) warhead to improve counter battery fires, and a binary chemical warhead. Codevelopment of TGW by the United States, United Kingdom, Germany, and France will continue in FY90. The MLRS M270 Launcher is being updated to accommodate launching the family of new munitions, including the ATACMS.

CHARACTERISTICS:

Warhead: Improved Conventional Munitions (ICM)
Propulsion: Solid

SOVIET COUNTERPART:

The Soviets have a very effective multiple rocket capability with several sizes of rockets. A new system, believed to be similar in employment concept and size, but larger than MLRS, is in late stage development.

PROGRAM STATUS:

The US Initial Operational Capability for MLRS was achieved in 1983. Starting in FY89, MLRS will be coproduced by the United States, United Kingdom, Germany, France and Italy. Second multiyear procurement contract for FY89-93 is being negotiated. The FY90 TGW program begins Full Scale Development.

CONTRACTORS:

LTV Aerospace and Defense (Dallas, TX)
Norden Systems (Norwalk, CT)
Atlantic Research (Camden, AR)
Brunswick Corp (Camden, AR)
Norris Industries (Los Angeles, CA)
Bendix Corp (Redbank, NJ)

US ARMY
LIFT HERE
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Army Tactical Missile System (Army TACMS)

MISSION:	The Army has an urgent need for a long-range weapon that operates in near all weather, day or night, is air transportable and capable of effectively engaging high priority land targets at ranges beyond the capability of cannons, rockets, and the Lance Missile System. The system will be used to attack tactical surface-to-surface missile sites, air defense systems, logistic elements, command/control/communication complexes, and second echelon maneuver units arrayed in depth throughout the corps area of influence.
CHARACTERISTICS:	The system will be a ground-launched conventional missile system consisting of a surface-to-surface semi-guided ballistic missile with an Anti-Personnel/Anti-Materiel (APAM) warhead. Army TACMS will be fired from the modified M270 MLRS launcher. The system will utilize targeting systems, engagement systems, and command control systems that are the same as MLRS.
PROGRAM STATUS:	Missile test flights began in 1988. Low Rate Initial Production (LRIP) will begin in FY89. The FY90 program will initiate Full Rate Production. First Unit Equipped (FUE) date is 4th Qtr, FY90.
CONTRACTOR:	LVT (Prime) (Dallas, TX)

M109A2/A3 Self-Propelled Howitzer/ Howitzer Improvement Program (HIP)

MISSION:

The M109A2 is an improved version of the M109 self-propelled howitzer that was fielded in the early 1960's. The M109A3 is a depot modified M109A1 with the same performance capabilities as the production M109A2. The M109 is designed to provide the primary indirect fire support to the maneuver brigades of the armored and mechanized infantry divisions. The M109A2/A3 is air transportable in a C5 and is capable of firing both conventional and nuclear munitions. The Army, in October 1985, initiated the development of a major system modification of this fielded system. The HIP modification includes: A new cannon and mount, automotive improvements, crew Nuclear/Biological/Chemical (NBC) protection, driver's night vision, secure communications, ballistic computer and navigation system and built in test equipment. HIP will provide significant improvements in system survivability, responsiveness, lethality, and reliability.

CHARACTERISTICS:

	M109A2/ A3	**Howitzer Improvement Program**
Range:	23.5 km w/Rocket Assisted Projectile (RAP) 18.1 km unassisted	30 km with RAP 22 km unassisted
Weight:	56,000 lbs	Max 62,000 lbs (Combat Loaded)
Length:	29.9 ft	30.5 ft
Height:	10.8 ft	11.5 ft
Width:	10.3 ft	Same
Main Armament:	155 mm cannon (M185)	Improved 155 mm cannon (M284)
Secondary Armament:	Machine Gun Cal. .50 and M16A1 rifles	Same
Crew:	6 (+ Accompanying Vehicle M548/3)	Same
Cruising Range:	220 miles (345 km)	Same
Ammunition:	All ammunition except the M203 charge	All ammunitions

SOVIET COUNTERPART:

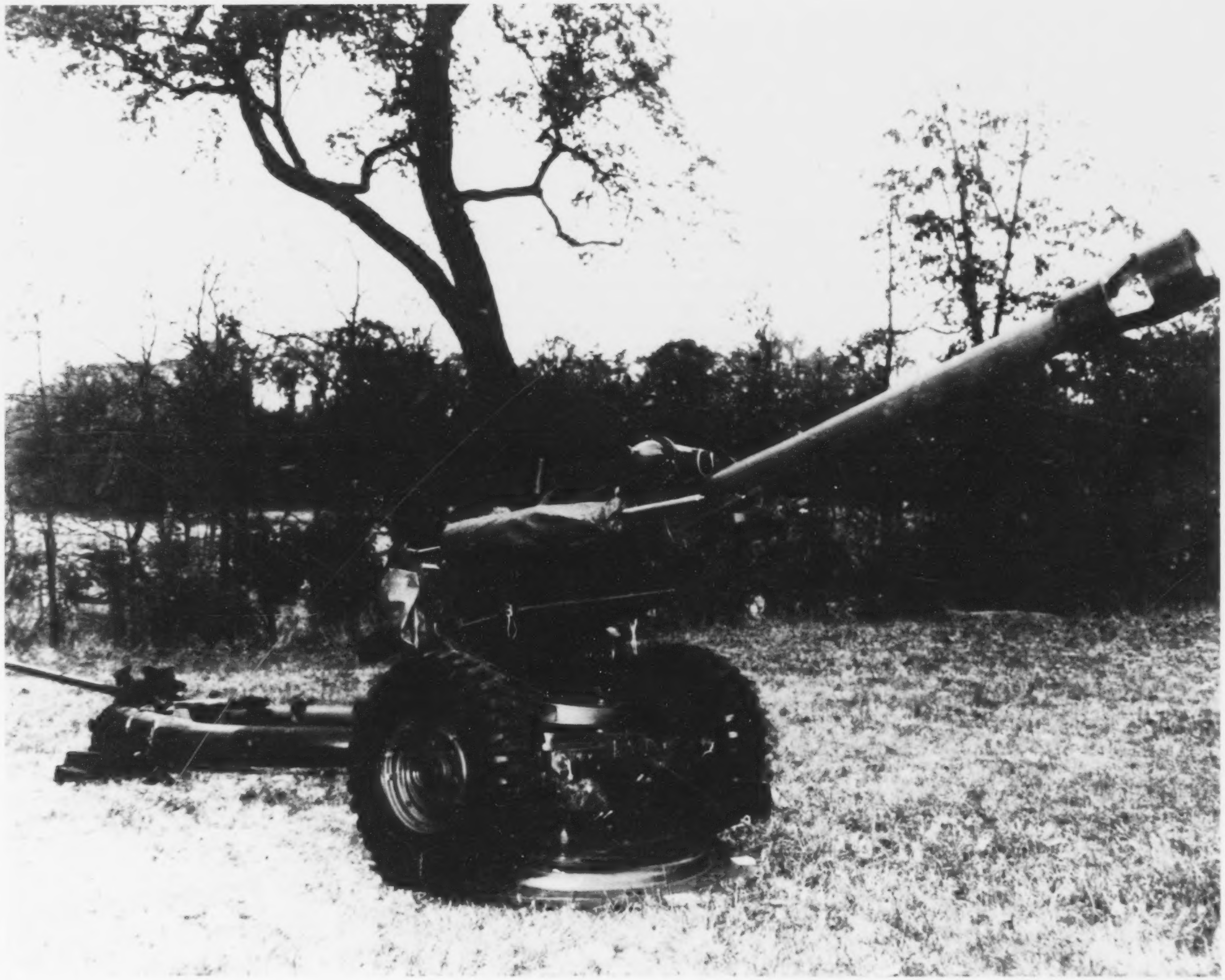
The Soviets have a modern 152mm self-propelled howitzer designated 2S3. It is considered comparable to the M109A2 in most performance characteristics.

PROGRAM STATUS:

Six HIP prototypes were built in FY88. Limited production begins in FY89 to achieve a First Unit Equipped date in FY91.

CONTRACTOR:

BMY, a Division of Harsco Corporation (York, PA)



M119 105mm Howitzer

MISSION:

The M119 is a non-developmental 105mm light howitzer from the United Kingdom. It will replace all M102's in the Army inventory. The M102's will then be used to replace all remaining M101A1 howitzers. The M119 will provide fire support for the six light infantry divisions and other Rapid Deployment Forces. This weapon affords the commander the improved range and performance needed to maintain his maneuverability and quick strike capability. It will fire all conventional 105mm ammunition in the inventory plus two enhanced capability rounds now under development. It is airmobile with the UH-60 helicopter and its prime mover will be the High Mobility Multipurpose Wheel Vehicle (HMMWV).

CHARACTERISTICS:

Range (kilometers):	14.0 DPICM, 14.3 HE, 19.5 Rocket Assisted Projectile (RAP)
Weight:	4,000 pounds
Width:	5 feet, 10 inches
Length:	20 feet, 1 1/2 inches
Height:	4 feet, 6 inches (Traveling Configuration)
Crew:	7
Ammunition:	HE, Smoke, Illumination, HE-RAP.

SOVIET COUNTERPART:

The nearest Soviet counterpart is the D-30 122mm howitzer. It is fielded in Soviet, Warsaw Pact, and other armies. Its range is 15.4 km, it weighs 7,000 pounds, and requires a crew of 7 personnel. The 122mm projectile is significantly more lethal more than the 105 mm.

PROGRAM STATUS:

The M119 was type-classified standard in December 1985. The weapon began production in the United Kingdom during 1987, and initial production in the U.S. arsenal system began in 1988. In FY90 total production will shift from the U.K. to the U.S. arsenal system and procure 79 howitzers. Fielding of the first unit is scheduled for 1989.

CONTRACTORS:

Royal Ordnance, United Kingdom
US: Watervliet Arsenal, N.Y.
Rock Island Arsenal, IL

Firefinder Radars (Artillery Locating Radar (AN/TPQ-37) and Mortar Locating Radar (AN/TPQ-36)

MISSION:

FIREFINDER radars enable friendly forces to locate and bring immediate fire upon enemy mortar, artillery, and rocket-launching positions, silencing them before they can adjust their fires on friendly units and positions. The world's first automatic hostile-weapon-locating systems, FIREFINDER radars use advanced phased array antenna techniques complete with computer-controlled signal processing. They function by spotting enemy projectiles in flight and mathematically backplotting their trajectory. The position of the weapon is reported in grid coordinates that can be fed automatically into artillery fire direction centers, enabling them to target the enemy weapons with guns, rockets, or other ordnance. Upon fielding of the Army Data Distribution System (ADDS), the link from the radars to fire direction centers will pass this position data on a near real-time basis. In tests, both radars, in combination with fire control devices, enabled an artillery unit to have accurate counterfire on the way before the first enemy projectile struck the ground. In actual combat action in Lebanon (1984), the AN/TPQ-36 performed equal to or better than the test results. Each Army division is being equipped with two artillery locating radars and three mortar locating radars.

SOVIET COUNTERPART:

The closest Soviet counterpart to FIREFINDER radars is the ARK-1, a system with significantly less capability.

PROGRAM STATUS:

Fielding of the AN/TPQ-36 and AN/TPQ-37 to the Active Army was completed in 1987. Completion of fielding to the Reserve Component is scheduled for July 1990. FIREFINDER II, which will upgrade the current systems to a more capable radar on a single vehicle, is scheduled to enter Full Scale Engineering Development in FY92.

CONTRACTOR:

Hughes Aircraft (Fullerton, CA)

Combat Support is an aggregation of the following mission areas dedicated to providing operational assistance to combat arms.

(1) Engineer Support relates to combat engineer efforts and mine/countermine warfare.

(2) NBC relates to supporting combat operations in a nuclear, biological, chemical environment

(3) Theater Tactical Intelligence relates to providing theater/tactical commanders with intelligence and information to support planning, the conduct of combat operations, and the readiness of forces combat operations.

COMBAT SUPPORT

M9 Armored Combat Earthmover (ACE)

MISSION:

The M9 ACE is a highly mobile (tracked), amphibious armored earthmoving vehicle that can move, survive, and work with the flow of battle, responding immediately to the maneuver commander's need for elimination of enemy obstacles, creation of obstacles to enemy maneuver, preparation of fighting positions for the fighting forces, expedient antitank ditching and maintenance of roads and supply routes. The ability to perform these tasks in the highly lethal and mobile AirLand battlefield assures that friendly force momentum is maintained in the offense, that enemy forces are slowed, channelized and made more susceptible to friendly fire in the defense while providing protected positioning from which our weapon systems can fight. Digging, dozing, hauling, scraping, and grading earthmoving tasks can be accomplished further forward on the battlefield than ever before. Its highly mobile (tracked), amphibious, light armored capabilies make this earthmover tough enough to live and fight with the infantry and fast enough to move with tanks. The M9 ACE is an essential force multiplier and a key member of the combined arms team on the Airland Battlefield.

CHARACTERISTICS:

Weight:(Empty):	36,000 lbs
Loaded:	54,000 lbs
Speed:	30 mph
Air Transportable:	C-130, C-141B, C-5B aircraft
Amphibious:	3 mph
Survivable:	Small arms, artillery fragmentation, and operator NBC protection.

SOVIET COUNTERPART:

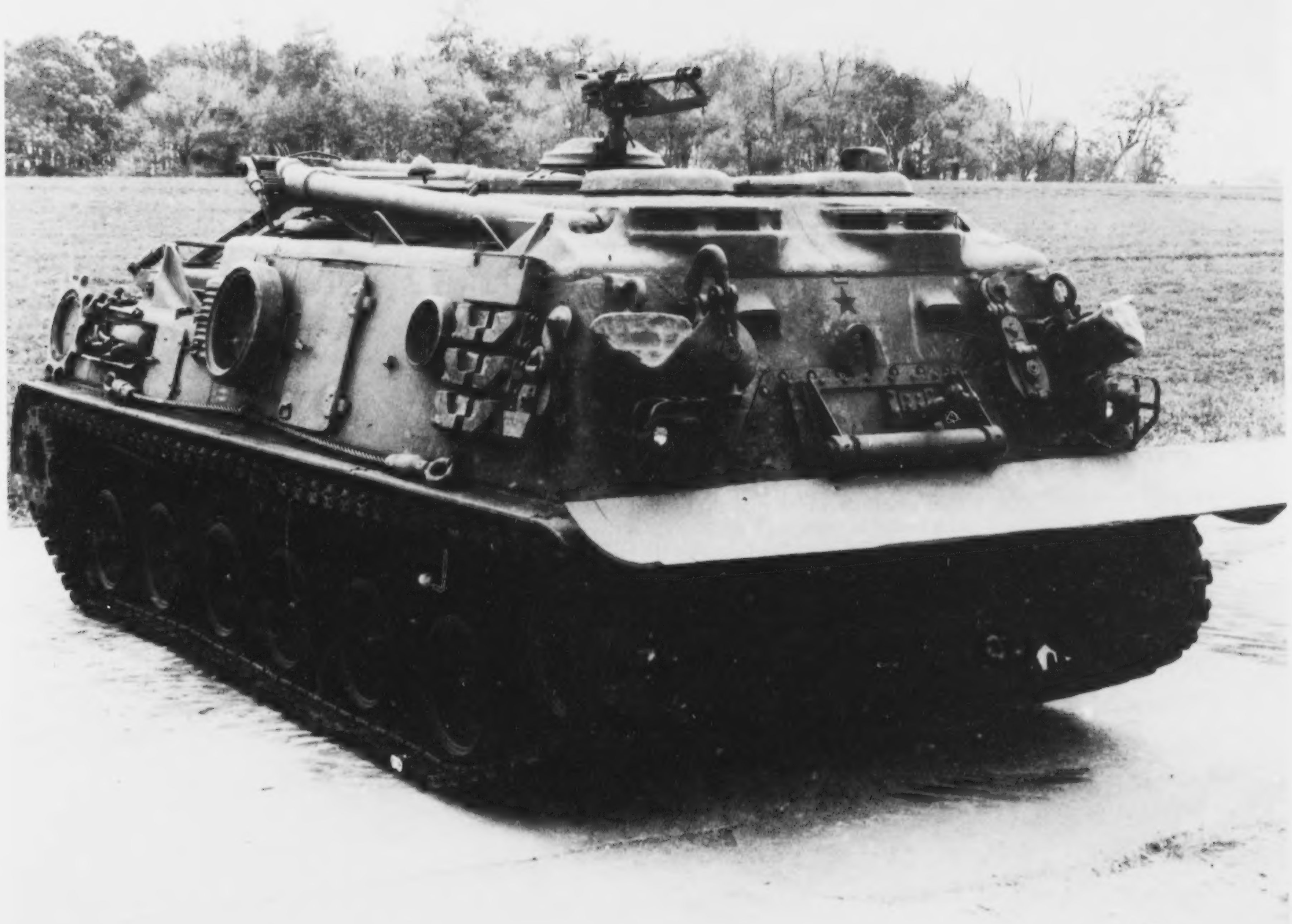
Although the Soviets have no direct counterpart to the M9 ACE, they do employ several pieces of equipment, each fielded in large quantities, which presently give Soviet combat units at least twice the engineer support of comparable US units. Examples are their MDK series of ditching machines, the BAT/M heavy, tracked dozer and the IMR Armored Engineer Tractor. The latter consists of a T-55A tank chassis with hydraulically controlled hinged blade, crane with telescoping boom, armored cupola and internal overpressure system. The Soviets are in their third or fourth generation fielding of these items.

PROGRAM STATUS:

The 7th Infantry Division (light) was the first unit equipped with seven of the low rate initial production (LRIP) vehicles. The training base (TRADOC) received three LRIP vehicles in November 1986. Initial production testing was completed during the June-August 1988 time frame. Deliveries of the full production vehicles to the field is scheduled to begin in the March-June 1989 time frame. The FY89 contract option for 132 vehicles was awarded in January 1989.

CONTRACTORS:

BMY, a Division of Harsco Corporation (York, PA)



M88A1 Medium Recovery Vehicle

MISSION:

The M88A1 is a full-tracked, armored vehicle designed for hoisting, winching and towing operations to effect battlefield recovery and evacuation of tanks and other tracked combat vehicles. The M88A1 is the primary recovery vehicle in the Army inventory for M1 Abrams tank, M2/M3 Bradley Fighting Vehicles, M60 series tanks, and heavy self-propelled artillery. The M88A1 is being improved to include a larger engine, greater winch and boom capability, additional weight, and increased armor protection in order that it can safely recover and evacuate the M1A1 tank.

CHARACTERISTICS:

Length: 325 inches
Width: 135 inches
Height: 123 inches
Weight: 56.0 tons
Top Speed: 27 mph; 18 mph with towed load
Armament: One .50 cal machinegun

Power Train: 12-cyl, 750 hp air-cooled diesel engine with 3 speed automatic transmission
Cruising Range: 30 miles
Draw Bar Pull: 90,000 lbs
Boom Capacity: 25 tons

SOVIET COUNTERPART:

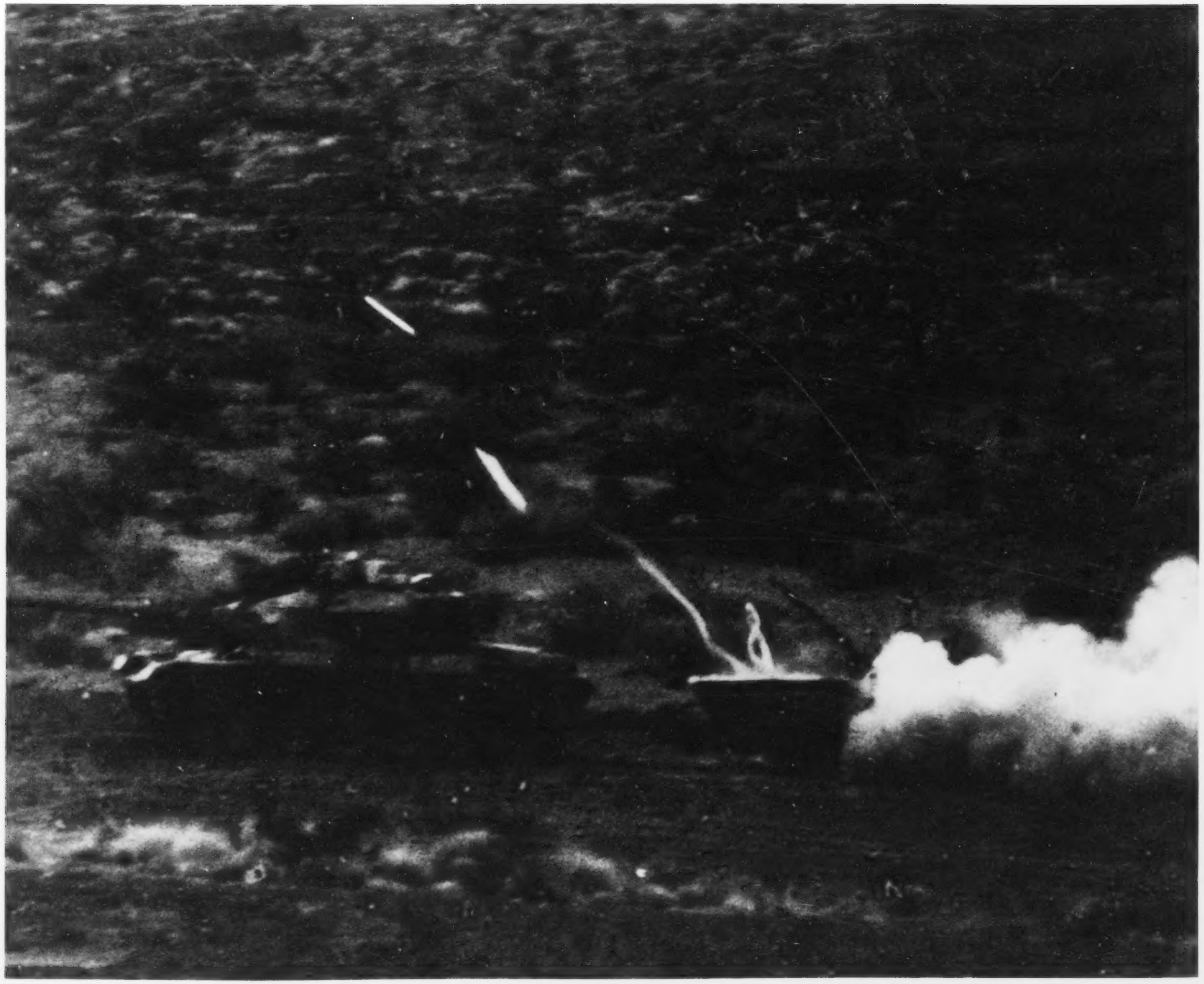
The Soviets have historically based recovery vehicles on existing chassis design. The most current is a vehicle based on a T-72 chassis. T-62, T-54, T-55-T, and JSU-T recovery vehicles are still in the Soviet inventory.

PROGRAM STATUS:

Conversion of all M88's in the US Army to M88A1's was completed in February 1982. The M88A1 is currently in procurement. The M88A1 is being fielded in Mechanized Infantry Battalions in support of the Bradley Fighting Vehicles. Improvements will increase tractive power, winch pull, winch lift, and crew survivability. The Army has awarded an R&D contract to BMY to continue development of the M88A2. BMY won the right to continue in a competitive source selection with the General Dynamics Recovery Vehicle candidate. A production decision is being considered but is not scheduled until 1rst Qtr, FY90.

CONTRACTORS:

BMY Company (York, PA)
GMC, Detroit Diesel Allison Div. (Indianapolis, IN)
Teledyne Continental Motors (Muskegon, MI)
Firestone Tire (Moblesville, IN)
Goodyear Tire (St. Marys, OK)
Standard Products (Port Clinton, OH)
Pacific Car & Foundry (Renton, WA)
Bata Engineering (Batawa, Ontario, Canada)
Adviondack (Watervliet, NY)
Rogers Olympic Corp. (Seattle, WA)
Buckeye Steel Casting (Columbus, OH)
Ferguson Gear (Gastonia, NC)
Berwick Forge (Berwick, PA)



Mine Clearing Line Charge (MICLIC)

MISSION:

Army ground combat forces require a system which can be rapidly deployed by engineer units to clear lanes in minefields. Operations must be capable of being conducted under enemy fire and in daylight or darkness. The Army is acquiring the US Marine Corps Trailer-Mounted M58 Line Charge System, which consists of the M53 high explosive (HE) linear demolition charge, the Mark 22 rocket (5 inch) for projecting the explosive charge across the minefield, a rocket launcher with firing kit, and the standard Army M353 trailer or M200A1 trailer. The M68 inert linear charge is used for training. The charge is contained in a box which is cradled on the rocket launcher. The launcher, in turn, mounts on the trailer. The assembled system is towed by a light forces engineer vehicle to about 50 meters from the edge of a minefield and the rocket is fired pulling the line charge across the minefield with it. In heavy forces, the MICLIC is towed by a tank or engineer M113 Armored Personnel Carrier. After the line charge is resting across the minefield, the operator detonates it, thus neutralizing mines along the 110 meter length of the line charge and 4 meters on both sides. Three MICLIC systems will be issued to each engineer company in Divisional and Corps Combat Engineer Battalions.

CHARACTERISTICS:

System Weight:	2.5 tons
Explosive Line Charge:	Length-110 meters; weight - 1850 lbs
Dimensions of Minefield Breach:	8 meters x 100 meters

SOVIET COUNTERPART:

The Soviets have fielded the M1979, second generation tracked explosive mine breaching system. The M1979, assigned to Soviet Divisional Engineer Battalions, performs similarly to the US MICLIC, clearing a lane approximately 8 meters by 75 meters with a demolition charge.

PROGRAM STATUS:

The USMC MICLIC began production in FY83. The Army procurement began in FY86. Fielding is complete in US Army Europe (USAREUR) and 8th Army (Republic of Korea), and ongoing in Forces Command (FORSCOM).

CONTRACTOR:

Thiokol, Inc. (Shreveport, LA)
Martin Marietta Ordnance System, Inc. (Milan, TN)

VOLCANO

Multiple Delivery Mine System (VOLCANO)

MISSION:

VOLCANO is a rapid mine dispensing system. It incorporates the GATOR antitank and antipersonnel mines. These mines are pre-loaded into canisters which can be placed in standard dispenser racks for Army helicopter or ground vehicle use. VOLCANO is composed of mounted launcher racks with mounting hardware, an electrical dispenser control unit and the mine canisters. VOLCANO provides a rapid and flexible means of placing tactical minefields to delay, canalize, and interdict attacking enemy forces. The helicopter system, which will replace the M56 helicopter delivered mine, will permit low altitude, reduced vulnerability and delivery of 960 mines by a single Black Hawk (UH-60A). Five-ton cargo and dump trucks and Tracked Cargo Carrier, M548 mounting similar dispensing systems will also deliver 960 mines to create tactical minefields. Air systems will be issued to combat aviation companies and ground systems to divisional and corps combat engineer companies. Mine canisters will be supplied within the Class V supply system.

CHARACTERISTICS:

VEHICLES	NUMBER OF SYSTEMS	NUMBER OF CANISTERS	NUMBER OF MINES
UH-60A Black Hawk	One-4 Racks	160	960
M817 5-Ton Dump Trk	One-4 Racks	160	960
M814 5-Ton Cargo Trk	One-4 Racks	160	960
M548 TRK Cargo Carrier	One-4 Racks	160	960

SOVIET COUNTERPART:

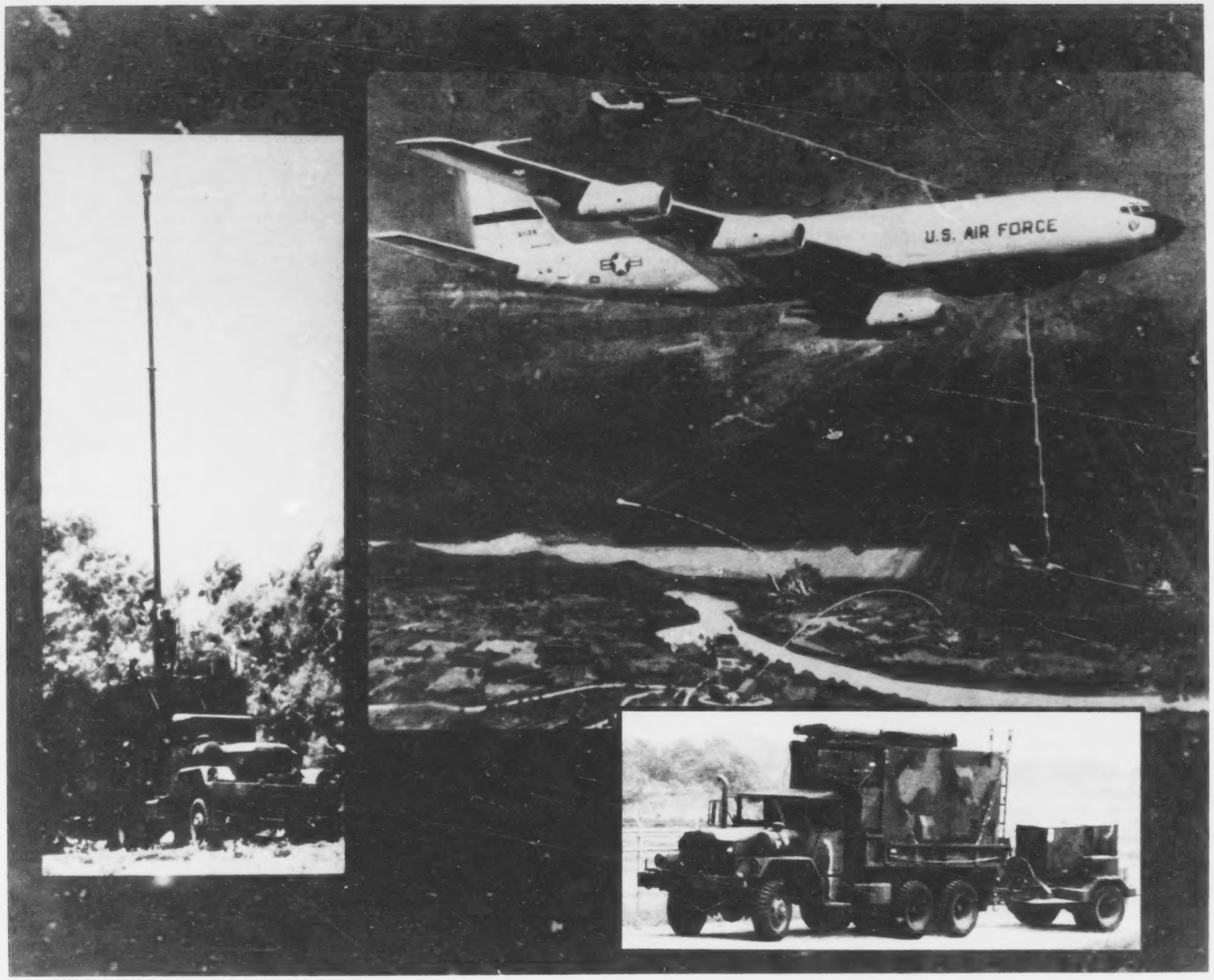
The Soviets can deliver mines from helicopters and ground vehicles, but their systems are not directly comparable to the VOLCANO.

PROGRAM STATUS:

The VOLCANO has been in procurement since FY87 to meet the urgent requirement for Scattermine Systems in the motorized and light infantry divisions.

CONTRACTORS:

Honeywell (Hopkins, MN)
Day & Zimmerman, Inc. (Texarkana, TX)


U.S. AIR FORCE

Joint Surveillance and Target Attack Radar System (Joint STARS)

MISSION:

Joint STARS is a battle management and targeting system which detects, locates, tracks, classifies and assists in attacking both moving and stationary targets beyond the Forward Line of Troops (FLOT). This allows the commander to DECIDE (situation intelligence), DETECT (targeting intelligence), and DELIVER (trigger delivery of ordnance, direct attack aircraft or counter enemy movements by maneuver of friendly forces). The Air Force is responsible for the Prime Mission Equipment (PME): platform, radar, data link. The Army is responsible for the Ground Station Modules (GSM)—tactical data processing and evaluation distribution centers that link the Joint STARS radar (through the data link) to Army C3 nodes at corps and division levels. The GSM will process Joint STARS and OV-1D Mohawk radar data. Plans are underway to enhance the GSM to process imaging data from unmanned aerial vehicles and NATO airborne radars. Situation development information is transmitted through the All Source Analysis System—(ASAS) and targeting information is transmitted through the TACFIRE/AFATDS system to their respective users. The GSM program will develop and incorporate nuclear/blast hardening and NBC filtering into a Block II GSM configuration.

CHARACTERISTICS:

Detection range:	In excess of 100 km into hostile territory
Aircraft:	E-8 (militarized Boeing 707)
Target:	Moving, fixed, tank-sized targets

SOVIET COUNTERPART:

The Soviets have a variety of airborne radar systems; however, there is no known Soviet system comparable to Joint STARS.

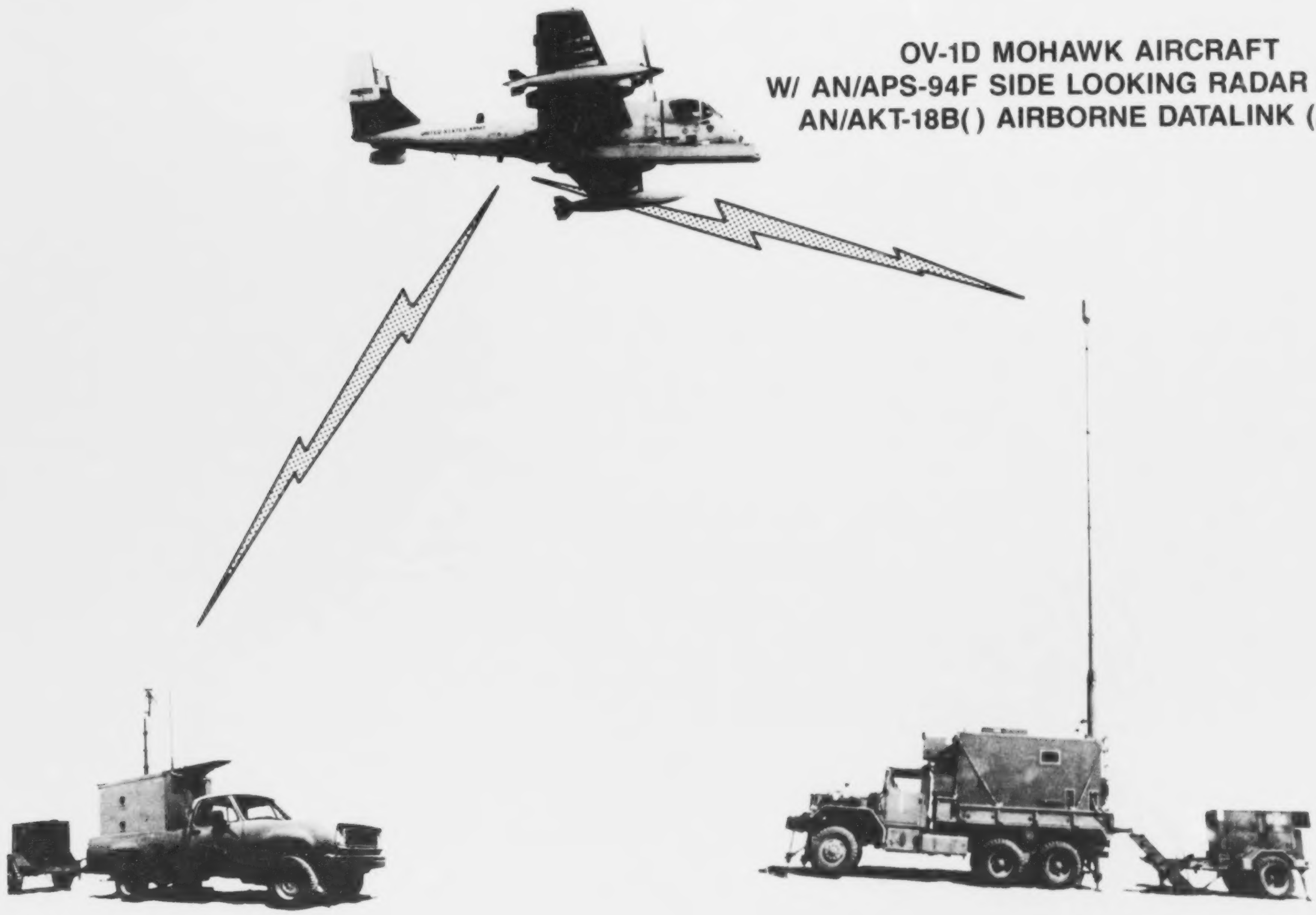
PROGRAM STATUS:

The PME and GSM are in Full Scale Engineering Development. There is also a Limited Procurement Urgent (LPU) of 11 GSM's. Two of these LPU systems are for a NATO effort called the Airborne Radar Demonstration System. A field test demonstration with the fully operational GSM and a full scale development platform radar is planned for early 1992.

CONTRACTOR:

Motorola Corporation (Tempe, AZ) (Ground Station)
Honeywell, Incorporated (Minneapolis, MN) (Simulator/Trainer)
Gruman Aerospace (NY/Melbourne, FL) (PME)
Norden Systems Division of United Technologies (Norwalk, CT) (PME)

AN/UPD-7 RADAR SURVEILLANCE SYSTEM



OV-1D MOHAWK AIRCRAFT
W/ AN/APS-94F SIDE LOOKING RADAR (SLAR)
AN/AKT-18B( ) AIRBORNE DATALINK (ADL)

AN/TKQ-2B( )
GROUND STATION TERMINAL (GST)

AN/TSQ-132( )
GROUND STATION MODULE (GSM)

OV-1D (Mohawk) Surveillance System

MISSION:

The OV-1D, MOHAWK, is a two place, twin turboprop, combat aircraft equipped with side-looking, airborne radar (AN/APS—94F) and photographic (KA-60/76) camera capable of monitoring enemy movement in daylight, darkness, and inclement weather. The primary sensor is the AN/UPD-7 airborne radar surveillance system. When used in conjunction with a data link, the radar information is transmitted to a ground based receiving system which has the capability to convert the received signals back to film for near real time viewing analysis. The AN/UPD-7 system is capable of interfacing with the Ground station Module (GSM) of JSTARS. The Block Improved OV-1D program will increase the structural life of the airframe, upgrade the on-board avionics and incorporate a controls and display system in the cockpit. Plans call for a reengine of the T53-L-701A to the T53-L-704 configuration, thus providing the extra margin of power needed during critical aircraft maneuvers. The radar surveillance system will also be modified to improve reliability, availability, and maintainability by replacing obsolete components. Two safety improvements will improve the deicing capability of the aircraft and add a stall warning system. This program of planned improvements to the OV-1D will result in a significant increase in readiness and mission capability and insure continuous intelligence to the tactical commander.

CHARACTERISTICS:

	Side looking Airborne
Mission Weight:	18,587 lbs.
Cruise Speed:	210 knots
Endurance:	4.0 hours
Maximum Range:	820 nautical miles
Crew:	2
Armament:	Not Applicable
Payload (mission equipment)	2,129 lbs.

PROGRAM STATUS:

The OV-1D is currently deployed in Military Intelligence Battalions (Aerial Exploitation): three Outside Continental United States (OCONUS), two in Forces Command (FORSCOM), and two in the National Guard. The Army is currently under contract for a prototype Block Improved OV-1D aircraft.

CONTRACTORS:

Grumman Aerospace (Stuart, FL)
Motorola Inc. (Tempe, AZ)
Lycoming (Stratford, CT)

Quick Fix

MISSION:

Quick Fix is a tactical, electronic warfare, heliborne jamming system configured in the EH-1H, EH-1X, and EH-60A (Black Hawk airframe) helicopters. Each aircraft has the capability to intercept and jam radio communications, and the EH-1X and EH-60 (Quick Fix II) versions can also locate communication transmitters. The Army plans to buy 66 Quick Fix II aircraft. Quick Fix aircraft will be organic to division and armored cavalry regiment.

CHARACTERISTICS:

	EH-1H	EH-1X	EH-60A
Mission Gross Weight (lbs)	8,800	9,200	16,500
Cruise Speed:	100 knots	100 knots	137 knots
Endurance:	1.7 hours	1.5 hours	2.0 hours
Maximum Range:	250 nautical miles	250 nautical miles	266 nautical miles
Crew:	3	4	4
Armament:	Not Applicable	Not Applicable	Not Applicable
Payload (mission equipment):	1,050 lbs.	1,557 lbs.	2,130 lbs.

SOVIET COUNTERPART:

The Soviets have fielded a family of dedicated electronic warfare helicopters using at least two variants of the MI-8 and MI-17 helicopters.

PROGRAM STATUS:

Several interim EH-1H Quick Fix systems are currently fielded; the interim EH-1X system has ended production, and the EH-60A Quick Fix II is in production. The First Unit Equipped date for Quick Fix II was May 1988.

CONTRACTORS:

Electromagnetic Systems Laboratories, Inc. (Sunnyvale, CA)
Sikorsky Aircraft (Stratford, CN)
TRACOR, Inc. (Austin, TX)

UNITED STATES ARMY
15 932

Quick Look

MISSION:

The Quick Look System is an airborne, automatic, computer-controlled electronic intelligence system that provides corps and division commanders with the location and type of threat noncommunication emitters. Quick Look's airborne electronic equipment is mounted in the RV-1D Mohawk aircraft. The remainder of the Quick Look system is mounted in several surface vehicles. The Quick Look system which is in operational use with the Army's Aerial Exploitation Battalions, is capable of monitoring enemy operations by day or night and in the worst weather conditions.

CHARACTERISTICS:

Mission Weight:	17,882 lbs.
Cruise Speed:	210 knots
Endurance:	4.0 hrs
Maximum Range:	820 nautical miles
Crew:	2
Armament:	Not Applicable
Payload (Mission equipment):	1,850 lbs.

SOVIET COUNTERPART:

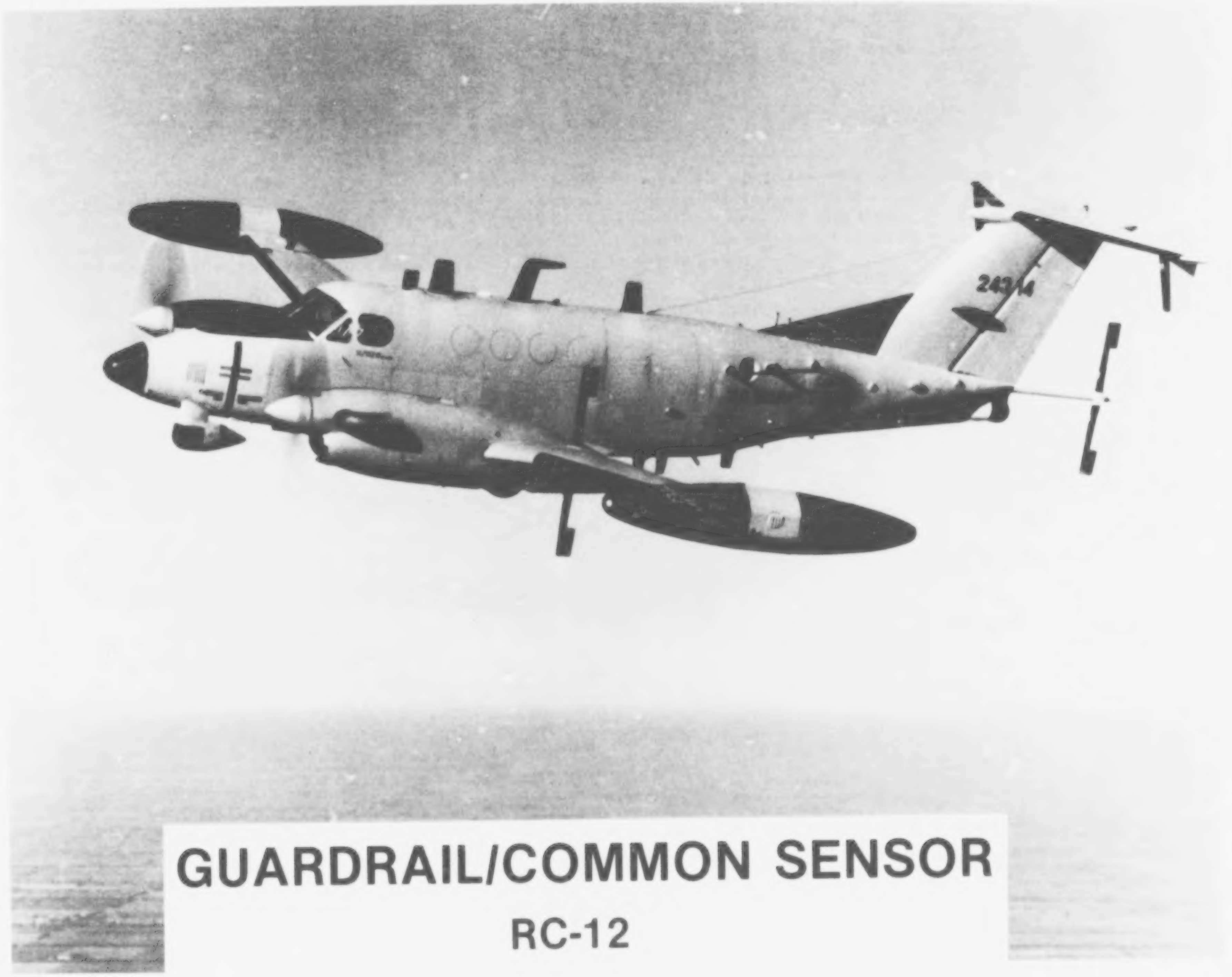
The Soviets are presumed to have aircraft capable of performing the same role and mission as Quick Look.

PROGRAM STATUS:

The RV-1D fleet will be retired as Guardrail Common Sensor is fielded. The first unit set will be retired in FY91, and the retirement will be complete in FY95. Due to the retirement schedule all Programmed Aircraft Restoration and Service Life Extension Program (PAR/SLEP) will be terminated after 2nd Qtr, FY89.

CONTRACTORS:

Grumman Aerospace (Stuart, FL)
UTL Corp (Dallas, TX)



GUARDRAIL/COMMON SENSOR

RC-12

Guardrail

MISSION:

Guardrail, a combined airborne and ground communications intelligence system, is designed to intercept and locate enemy communications emitters. The system provides timely and accurate data on enemy locations and plans, and will enable the commander to concentrate his combat resources at the critical time and place. The Guardrail V system uses the RU-21H aircraft; the Improved Guardrail V system uses the RC-12 aircraft; and, the future Guardrail Common Sensor system, which combines communications and electronic intelligence sensors, will use the RC-12K airframe.

CHARACTERISTICS:

	RU—21H	**RC—12D**	**RC—12K**
Mission Weight:	10,200 lbs.	14,200 lbs.	16,000 lbs.
Cruise Speed:	176 knots	200 knots	250 knots
Endurance:	4.0 hours	5(+) hours	5(+) hours
Maximum Range:	1,000 nautical miles	1,200 nautical miles	1,200 nautical miles
Crew:	2	2	2
Armament:	Not Applicable	Not Applicable	Not Applicable
Payload (mission: equipment)	1,126 lbs.	2,027 lbs.	1,413 lbs.

SOVIET COUNTERPART:

The Soviets have a wide variety of airborne and ground-mounted electronic warfare systems. There is no known Soviet system comparable to Guardrail, although the AN—12 CUB C performs similar missions.

PROGRAM STATUS:

Two Improved Guardrail V units were deployed in 1985. Contractor work for the Guardrail Common Sensor system mounted in the RC-12K started in 1984 and will enter the inventory in early 1991. Future plans call for upgrading all Improved Guardrail V's to the Guardrail Common Sensor configuration.

CONTRACTORS:

Beech Aircraft Corporation (Wichita, KS)
Electromagnetic Systems Laboratories, Inc. (Sunnyvale, CA)
UTL Corporation (Dallas, TX)
IBM (Oswego, NY)

Black Hawk

MISSION:

The UH-60 Black Hawk is replacing the UH-1 "HUEY" in air assault, air cavalry, and aeromedical evacuation missions. The Black Hawk can carry more than twice the UH-1 payload and is capable of transporting an entire 11-man, fully equipped squad faster and in most weather conditions. The Black Hawk is the first utility/assault helicopter that adds to the Army's Division level mobility; for example, it can reposition a 105mm howitzer, its crew of 6, and up to 30 rounds of ammunition in a single lift. Its critical components and systems are armored or redundant to enable it to withstand multiple small arms hits, and its airframe is designed to progressively deform on impact to protect the crew and passengers in a crash. Advanced technology in the Black Hawk makes it easier to maintain in the field than any other helicopter in the world. Black Hawk's full squad carrying ability significantly improves the small-unit commander's ability to retain control of his forces under combat conditions, and permits more rapid replacement of ammunition and other combat consumables in a high intensity war.

CHARACTERISTICS:

Max Gross Weight:	20,250 lbs.
Cruise Speed:	145 knots
Endurance:	2.3 hours
Maximum Range	330 nautical miles
Crew:	2 pilots, 1 crew chief
Armament:	Two 7.62mm machine guns
Payload:	2640 lbs. (or 11 combat equipped troops) at 4000 ft./95°F

NOTE: Performance characteristics at primary mission weight of 16,953 lbs.

SOVIET COUNTERPART:

The HIP series, much slower and used by the Soviets as a troop carrier and general cargo transport, can carry up to 24 troops.

PROGRAM STATUS:

Black Hawk is being procured under a four year, fixed-price multiyear contract covering FY88 to FY91. The Army has fielded the UH-60A Black Hawk to high-priority units in the continental United States (CONUS), Europe, Korea, Panama, and U.S. Army Western Command (WESTCOM). The 1000th Black Hawk was delivered to the Army in October 1988. FY89 deliveries will continue to U.S. Army Forces Command (FORSCOM), U.S. Army Training and Doctrine Command (TRADOC), U.S. Army Europe (USAREUR), and to Reserve and National Guard units.

CONTRACTORS:

Sikorsky (Stratford, CT)
General Electric (W. Lynn, MA)

CH-47 Modernization

MISSION:

The CH-47 Chinook, the Army's only medium-lift helicopter, is a twin-engine, tandem rotor, cargo helicopter. Designed in the 1950's and fielded in 1962, the CH-47's primary missions are movement of ammunition, repair parts, petroleum and tactical movement of artillery, troops, and special weapons on the battlefield. In 1975 a modernization program was approved to upgrade the CH-47A, B, and C models into a new "D" model configuration. These improvements extend the useful life of the fleet beyond the year 2000. The modernization includes new fiberglass rotor blades, transmission and drive systems, modularized hydraulics, electrical systems, advanced flight controls, triple hook cargo system, and an auxiliary power unit. These features greatly enhance reliability, maintainability, productivity, survivability, and safety of the medium-lift fleet.

CHARACTERISTICS:

Max Gross Weight:	50,000 lbs.
Cruise Speed:	162 knots
Endurance:	2.2 hours
Maximum Range:	300 nautical miles
Crew:	2 pilots, 1 crew chief
Armament:	Not Applicable
Payload:	15,873 lbs. (or 33 troops) @ 4000 ft., 95°F

SOVIET COUNTERPART:

The Soviets have one helicopter in the medium-lift category, the upgraded "HIP." It is not considered equal in performance or efficiency to the improved Chinook. They do, however, have the HOOK and HALO heavy lift helicopters.

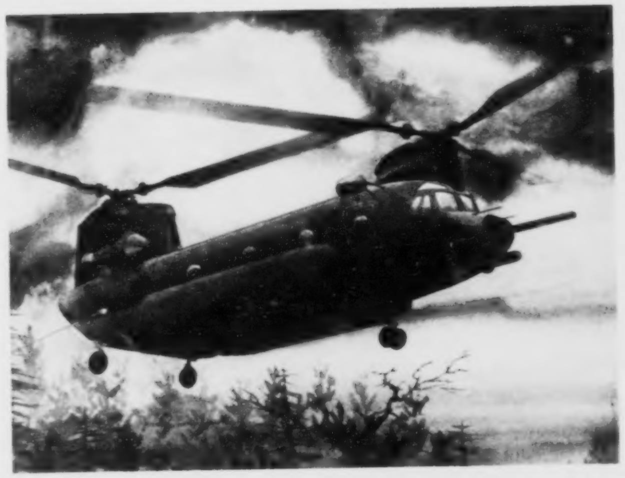
PROGRAM STATUS:

Planned production has been raised from 328 to 472 which will complete the modernization of the fleet to the "D" model configuration. Aircraft deliveries are on schedule. The program has been on cost since its inception. The Initial Operational Capability (IOC) date was attained in February 1984.

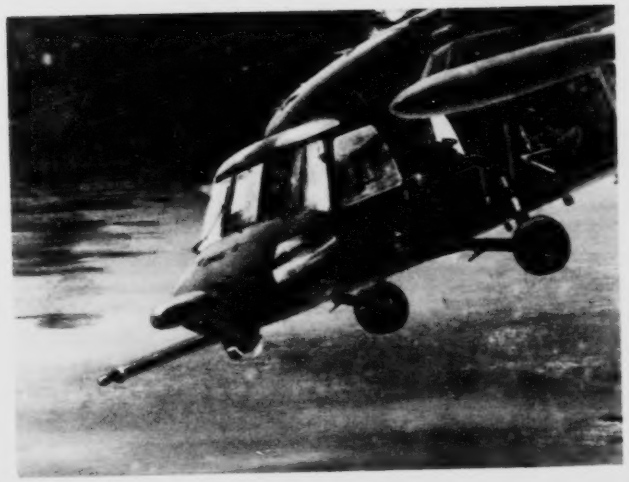
CONTRACTORS:

Boeing Vertol (Philadelphia, PA)
AVCO-Lycoming (Stratford, CT)

SPECIAL OPERATIONS AIRCRAFT (SOA)



MH-47E



MH-60K

Special Operations Aircraft (SOA)

MISSION:

The Special Operations Aircraft (SOA) are modified Black Hawk (UH-60A) and medium-lift Chinook (CH-47D) helicopters that will provide the Army with the capability for low level, night, adverse weather, extended range, precision navigation through unfamiliar mountainous terrain. Both the utility and medium-lift version (designated MH-60K and MH-47E, respectively) will be provisioned with extended range fuel systems including an aerial refueling capability, upgraded engines and worldwide communications equipment. Additional improvements include a totally integrated cockpit, which dramatically reduces pilot workload, as well as improved terrain following/terrain avoidance radar and forward looking infrared radar capability. Their missions cover rapid deployment, strategic intelligence strikes, and other operational missions supported by the Special Operations Forces.

CHARACTERISTICS:

	MH-47E	**MH-60K**
Mission Weight:	54,000 lbs.	24,500 lbs.
Cruise Speed:	138 knots	122 knots
Endurance*:	9.8 hours	7.6 hours
Maximum Self Deployment Range*:	1260 nautical miles	755 nautical miles
Crew:	4	4
Armament:	2 - 50 calibre machine guns	2 - 50 calibre machine guns
Payload:	42 troops	12 troops

*unrefueled w/30 min reserve: however, also has air-to-air refuel capability.

SOVIET COUNTERPART:

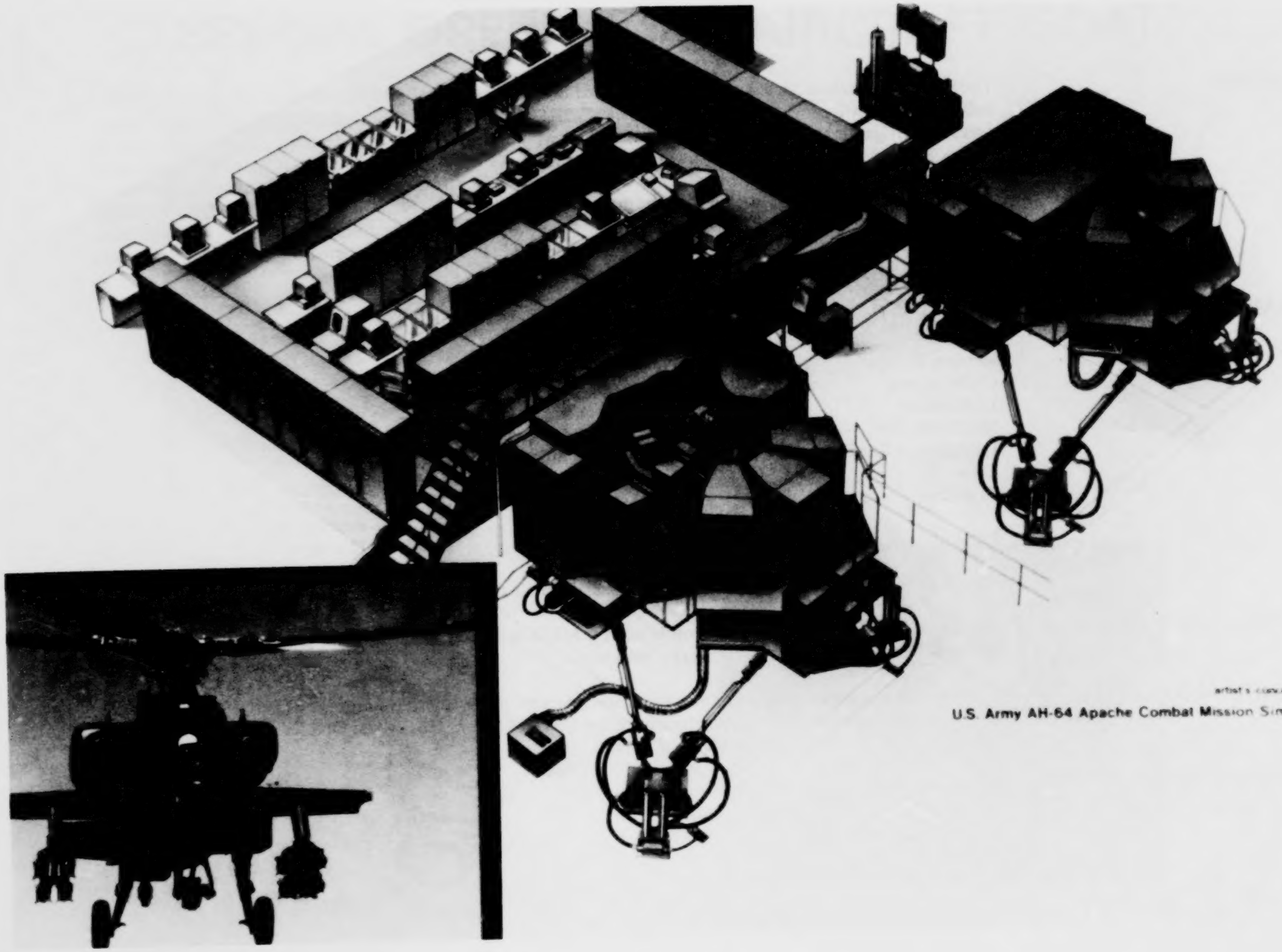
The Soviet MI-8 is a medium-lift helicopter and the MI-26 is a heavy lift helicopter. The HIP series and HALO performs troop carrier and general cargo transport.

PROGRAM STATUS:

The MH-47E and MH-60K are currently under development. MH-47E production is anticipated to begin in FY89 with First Unit Equipped (FUE) date during the 4th Qtr, FY91; for MH-60K 4th Qtr, FY92. The SOA program will provide 23 MH-60K and 51 MH-47E aircraft.

CONTRACTORS:

Boeing Helicopter Company (Philadelphia, PA)
Sikorsky Aircraft Division (Stratford, CT)
IBM FSD (Owego, NY)



artist's conception of

U.S. Army AH-64 Apache Combat Mission Simulator

Synthetic Flight Training Systems

MISSION:	The Army is acquiring flight simulators to improve training effectiveness, maintain combat readiness, and cope with current and future operating costs. This is being accomplished by providing high fidelity simulations of helicopter flight including nap-of-the-earth, combat environment, day/night instrument flight, and weapons engagements with enemy interaction, while at the same time, providing realistic and cost effective trainers. The Army's Synthetic Flight Training Systems (SFTS) are high fidelity, computer driven, flight weapon and mission simulators for the UH-1, MH/CH-47, AH-1, MH/UH-60 and AH-64 helicopters. The UH-1 simulator is an instrument flight and emergency procedures trainer mounted on a 5-degree-of-motion base. The remaining simulators are more complex devices mounted on advanced technology 6-degree-of-motion platforms, with cockpit window visual presentations for tactical, nap-of-the-earth mission training. All weapons systems in the attack helicopters are replicated for aircrew gunnery training.
SOVIET COUNTERPART:	There is no known comparable Soviet flight simulation capability but they do have flight simulators.
PROGRAM STATUS:	The total program is for 22 UH-1, one MH47, six CH-47, one MH-60, 16 UH-60, nine AH-1, and 13 AH-64 flight simulators. 22 UH-1, six Ch-47, six AH-1, eight UH-60 and six AH-64 simulators have been fielded. The remaining AH-1 and CH-47 simulators will complete fielding in FY89. Additional UH-60 and AH-64 simulators will be fielded through FY94. A contract for one MH47E Simulator (with option for one MH60K Simulator) was awarded in September 1988 to support the Special Operations Forces.
CONTRACTOR:	Link Division, Singer Co. (Binghamton, NY)

NIGHT VISION DEVICES

THE AN/PVS-4 INDIVIDUAL SERVED WEAPON SIGHT

THE AN/AVS-6 AVIATION NIGHT VISION IMAGING SYSTEM (ANVIS)

THE AN/PVS-7 NIGHT VISION GOGGLE

Night Vision and Electro-Optics

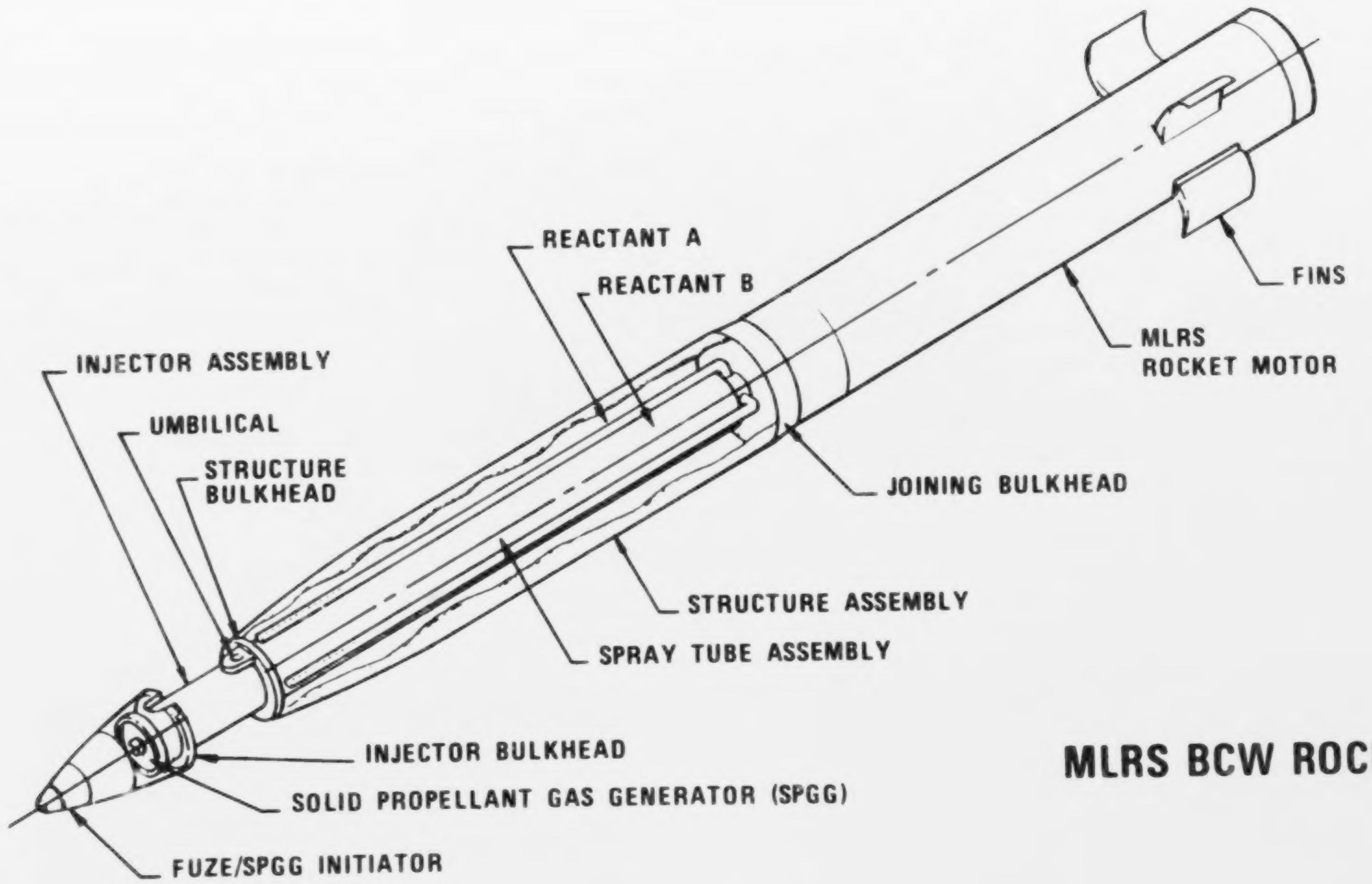
MISSION: The soldier is enabled to operate effectively during nighttime missions by utilizing and integrating night vision, electro-optic technologies and laser/thermal technologies. Some of the systems fielded are shown on the opposing page. The AN/PVS-3 Individual Served Weapon Sight provides passive sighting and viewing using second generation image intensification techniques. The AN/PVS-4 is designed primarily for use with the M14 and M16 rifles, the M60 machine gun, the M72A1 rocket launcher and the M203 grenade launcher. It can also be used by a commander for surveillance. The AN/PVS-7 Night Vision goggle provides passive sighting and viewing using third generation (high performance) image intensification techniques. The AN/PVS-7 is a lightweight, headmounted monocular unit. It is used to operate ground vehicles, for navigation, map reading, maintenance, first aid, etc. The AN/AVS-6 Aviation Night Vision Imaging System (ANVIS) is a light weight, high performance binocular unit using third generation image intensification techniques. The AN/AVS-6 was designed specifically for use by helicopter pilots during night flights including Nap-of-the-Earth (NOE) mission.

SOVIET COUNTERPARTS: The Soviets have some second generation devices, however, they do not have third generation (high performance) image intensification technology.

PROGRAM STATUS: This is the fifth program year of two 5 year multiyear contracts for all of the night vision devices discussed above. At the completion of the contracts, the Army will have received approximately 115,000 devices and 130,000 spare image intensifier tubes at a value of approximately $900 million.

CONTRACTORS:

ITT Corp., Electro-Optical Production Division (Roanoke, VA)
Optic-Electronic Corp. (Dallas, TX)
Varo, Inc. (Garland, TX)
Litton Systems, Inc., Electron Devices Division (Tempe, AZ)
Varian Associates, Varian Image Tube Division (Palo Alto, CA)
Hughes Optical Products Inc. (Des Plaines, IL)
Baird Corp. (Bedford, MA)
S-Tron (Redwood City, CA)


REACTANT A
REACTANT B
INJECTOR ASSEMBLY
UMBILICAL
STRUCTURE BULKHEAD
FINS
MLRS ROCKET MOTOR
JOINING BULKHEAD
STRUCTURE ASSEMBLY
SPRAY TUBE ASSEMBLY
INJECTOR BULKHEAD
SOLID PROPELLANT GAS GENERATOR (SPGG)
FUZE/SPGG INITIATOR

MLRS BCW ROCKET

Binary Chemical Munitions

MISSION:

National defense policy dictates that the United States reestablish a credible retaliatory chemical warfare capability. This policy is based on the belief that such a capability is the most effective deterrent to the first use of chemical weapons by a potential enemy. The Army's Chemical munitions stockpile has an average age of 27 years and is becoming obsolete through deterioration. The binary chemical munition is a means of modernizing this stockpile in a manner which is both technologically feasible and environmentally acceptable. The binary concept is a process by which a lethal chemical agent is formed from nonlethal components by means of a chemical reaction during flight of the weapon to a target. Significant advantages over current conventional chemical munitions are achieved in safety, transportation, production, storage, handling and final disposal.

CHARACTERISTICS:

Type binary munitions: Binary Chemical Warhead for the
Multiple Launch Rocket System
155mm Binary Chemical Projectile

SOVIET COUNTERPART:

Soviet forces are trained, equipped and structured to perform offensive and protective chemical warfare actions on the battlefield. They have produced, stockpiled and deployed large quantities of chemical agents and munitions. They have the tactical doctrine for the use of chemical weapons against targets for which they are best suited to gain tactical advantage. The circumstances under which the Soviets would initiate chemical warfare are not known. Their ability to do so, however, is undeniable, and they are likely to use chemical weapons against high priority, selected targets. Chemical weapons already have been produced by third world countries and were used in the Iran/Iraq war. The current inadequacy of the US retaliatory capability increases the probability of chemical weapons use by the Soviets and other nations.

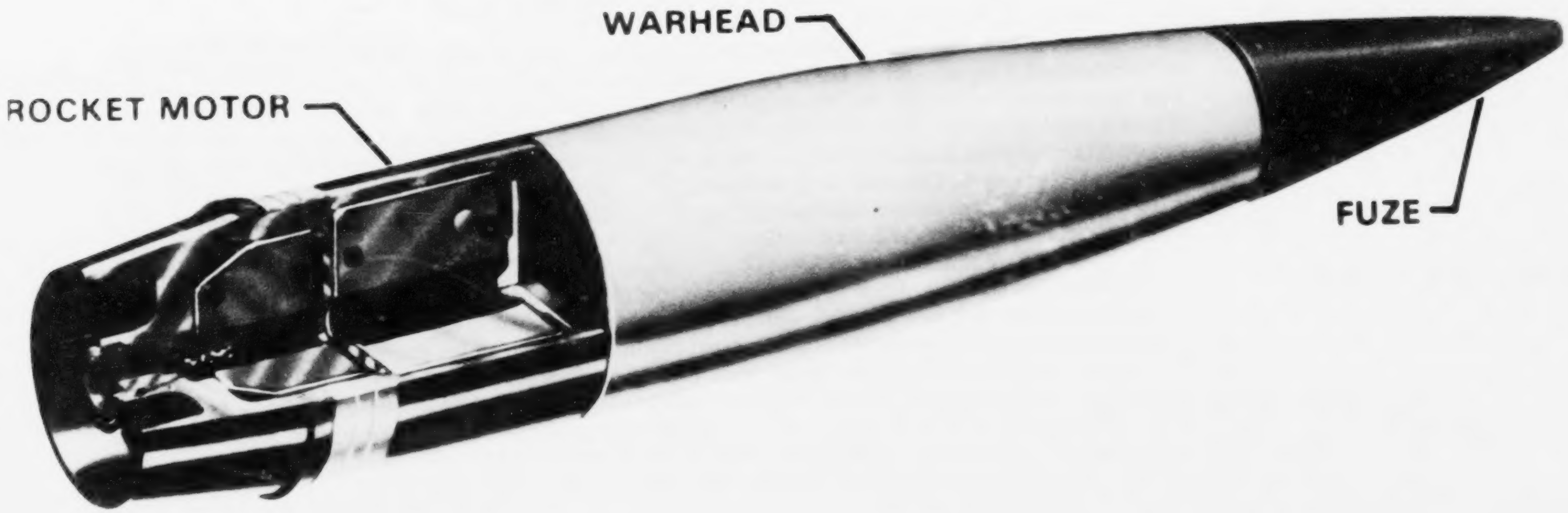
PROGRAM STATUS:

The President has determined that modernization of the chemical deterrent retaliatory stockpile is essential to the national interest and, in accordance with public law, has so certified to the Congress. The Army is pursuing development of a credible deterrent retaliatory capability by adding two binary chemical munitions to its arsenal. The 155mm binary chemical projectile has entered initial production. The MLRS binary chemical warhead is in the engineering development phase. This system complements the 155mm binary chemical projectile by providing greater range and area coverage than front line artillery to engage rear area military targets. Additionally, the Army supports the US Navy in the development of the BIGEYE binary chemical bomb. Both the Air Force and the Navy will procure the BIGEYE bomb and field it in the early 1990's.

CONTRACTORS:

Marquardt Company (Van Nuys, CA)
Morton Thiokol Corporation (Shreveport, LA)
Combustion Engineering Operations and Maintenance Corporation (Pine Bluff, AK)
LTV Corporation (Dallas TX)
KDI Corporation (Cincinnati, OH)
Parsons Company (San Diego, CA)

PROJECTILE, 155MM; NUCLEAR, XM785


WARHEAD
ROCKET MOTOR
FUZE

Improved Nuclear Projectiles

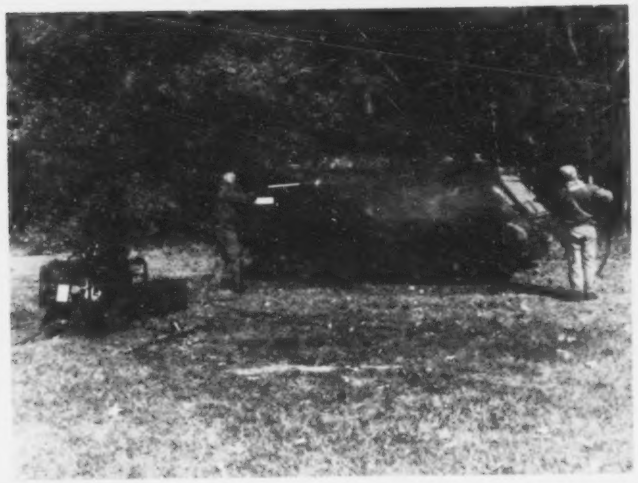
MISSION: The mission of the Non-Strategic Nuclear Forces is to deter both nuclear and conventional attack by enemy forces, and, should deterrence fail, to support the defense of the theater. The improved 155mm nuclear projectile will replace the current 155mm Artillery Fired Atomic Projectile which was developed in the 1950's. It will be more effective than the current 155mm nuclear projectile because of its improved reliability, increased range, and greater yield. Additionally, it contains security devices and command-disable features that prevent unauthorized use. It is compatible with the FH 70 NATO Howitzer and will be ballistically similar to the M549, high-explosive, Rocket Assisted Projectile. Fielding of an improved 155mm nuclear projectile will improve the effectiveness and survivability of tactical nuclear forces by providing a modern nuclear capability to US and NATO 155 cannon artillery units.

SOVIET COUNTERPART: The Soviets have a wide variety of tactical nuclear weapons. The number of nuclear capable and potentially nuclear-capable artillery cannons has increased by well over a factor of ten in the last decade.

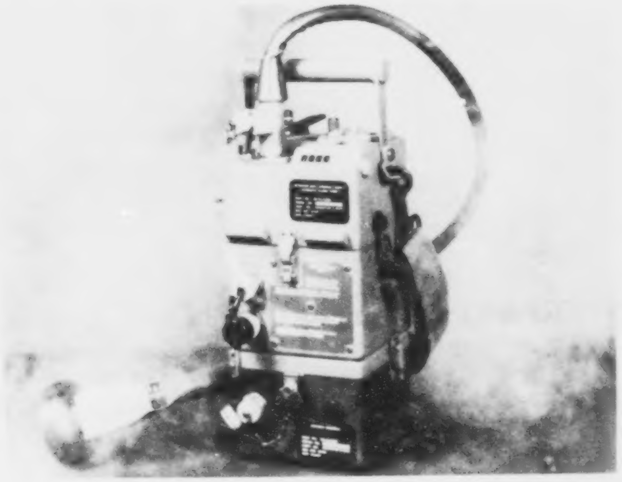
PROGRAM STATUS: The improved 155mm nuclear projectile is in Full Scale Engineering Development. It is a joint development between the Army and the Department of Energy.

CONTRACTORS:
Motorola Corp. (Scottsdale, AZ)
Sandia National Laboratories (Livermore, CA)
Sandia National Laboratories (Albuquerque, NM)
Chamberlain Manufacturing Corp. (Waterloo, IA)
Lawrence Livermore National Laboratory (Livermore, CA)
Ferrulmatic, Inc. (Patterson, NJ)

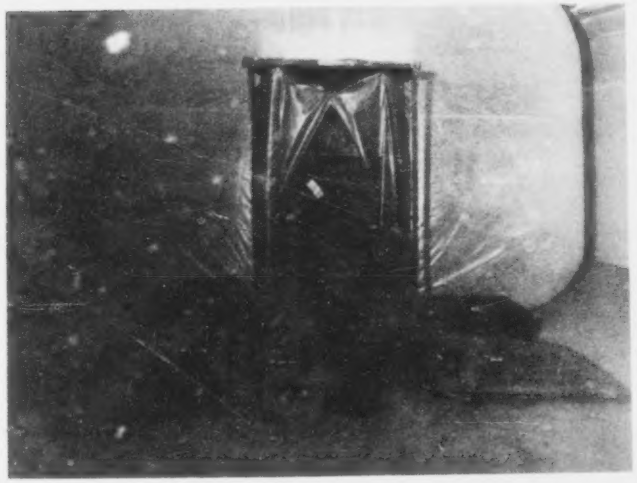
NUCLEAR, CHEMICAL, AND BIOLOGICAL DEFENSE



M17 LIGHT WEIGHT NBC
DECONTAMINATION SYSTEM



AUTOMATIC CHEMICAL AGENT
DETECTOR ALARM



M20 SIMPLIFIED NBC COLLECTIVE
PROTECTION EQUIPMENT

HAND HELD CHEMICAL
AGENT MONITOR

Nuclear, Chemical and Biological Defense

MISSION:

Nuclear, chemical and biological (NBC) defense allows US forces to survive, fight and win on a contaminated battlefield. NBC defense doctrine has evolved into three general principles. First, soldiers avoid contamination if the scheme of maneuver permits. Second, soldiers protect themselves from lethal or incapacitating doses if chemical agents cannot be avoided. Finally, soldiers decontaminate themselves and their equipment quickly to resume unimpaired operations.

SOVIET COUNTERPARTS:

The Soviet Union possesses an extensive arsenal of chemical weapons, delivery systems and protective equipment as well as an extensive chemical force structure. Their decontamination units outnumber US units 25 to 1. The Soviets incorporate collective protection within their combat vehicles and have fielded automated NBC reconnaissance systems. Chemical warfare is not limited to the Soviet Union as many other nations have such capabilities including a number of Third World countries.

PROGRAM STATUS:

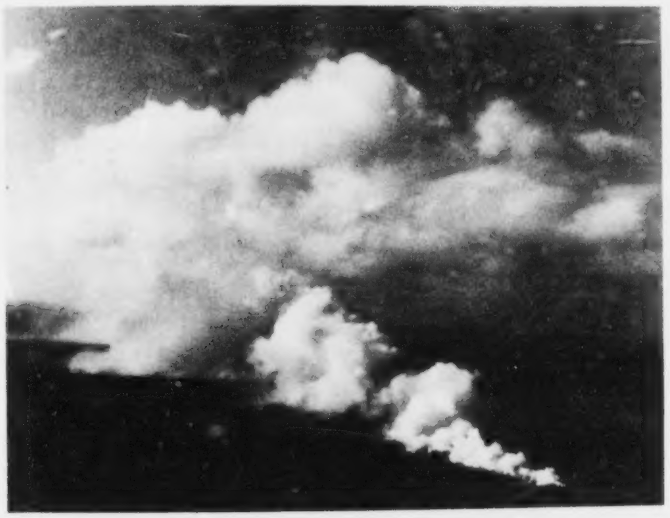
Acquisition is underway for an armored vehicle system to perform NBC contamination and ballistic hazards. Two automatic chemical agent detectors, one for point detection and the other for remote sensing, are being developed to detect all standard chemical agents. A chemical agent monitor developed by the United Kingdom is being procured to provide the Army its first hand-held instrument capable of detecting chemical contamination on personnel and equipment. An individual soldier radiac dosimeter to measure accumulated exposure to radiation is now in production. A vehicle mounted radiac set is in production which will monitor for radiation and warn vehicle crewmen of the hazard. To improve soldiers' eye and respiratory protection against NBC agents, a new protective mask has entered production. NBC collective protection systems are now fielded in many combat vehicles, vans and shelters to provide a clean air environment on a contaminated battlefield. Collective protection equipment now in production will convert an existing room into an NBC shelter. High pressure hot water supplied by the lightweight decontaminating system, also in production, provides soldiers the capability to partially decontaminate equipment. Improved decontamination systems are in development that will decontaminate sensitive electronics, optics and avionics and be less reliant on the use of water.

CONTRACTORS:

Brunswick Corp. (Chemical detector development) - (Delmaura, FL)
Engineered Air Systems Inc. (Decontamination system production) - (St. Louis, MO)
Environmental Analysis Systems Inc. (Chemical detector development) - (Towson, MD)
General Atomics (Decontamination system development) - (San Diego, CA)
Harshaw/Filtrol (Radiac production) - (Solon, OH)
ILC Dover (Protective mask production) - (Fredricka, DE)
Mine Safety Appliance (Protective mask production) - (Pitt, PA)
Nuclear Research Corp. (Radiac Production) - (Dover, N. J.)
Scott Aviation (Protection mask production) - (Hebron, OH)
Sechan Electronics Inc. (Radiac production) - (Lititz, PA)

SMOKE AND OBSCURANTS

INITIAL BURST OF M76 IR GRENADES



SMOKE FORMED FROM LARGE AREA SMOKE SCREENING

XM55 PRODUCING IR SMOKE ON M998 HMMWV

M825 WHITE PHOSPHORUS SMOKE PROJECTILE

Smoke and Obscurants

MISSION:

Smoke and obscurants greatly improve survivability on today's high intensity battlefield. Smoke grenades deployed from combat vehicles produce an instantaneous screen that defeats enemy electro-optic sensors and weapon guidance systems. Artillery, mortar and rocket delivered smoke rounds can be directed on enemy units or between friendly and enemy positions to degrade enemy vision or to screen the advance of friendly forces. Mounted on tactical and combat vehicles, large area screening-smoke systems help obscure high priority targets (airfields, bridges and ammunition depots) as well as convoys and troop movements.

SOVIET COUNTERPART:

Soviet doctrine emphasizes extensive use of smoke during tactical operations. They achieved remarkable success in reducing personnel and materiel losses with smoke tactics in World War II. The Soviet intention to employ smoke against NATO forces is clearly demonstrated by the level of smoke usage in Warsaw Pact exercises. They have extensive capability to produce visual smokes. Indications suggest that the Soviets are expanding their obscurant capability to other electromagnetic spectra.

PROGRAM STATUS:

A family of currently fielded smoke grenade launchers provides self-protection to armored vehicles. The initial systems degrade electro-optical devices such as day and night sights, anti-tank guided missiles, and laser range finders. Expanded capabilities are required to screen the infrared and millimeter regions of the electromagnetic spectrum in order to defeat advanced target and guidance systems. An infrared defeating smoke grenade (M76) is in production, and a millimeter screening grenade (XM81) is in development. A multi-salvo smoke grenade launcher now in development will provide the capability to employ smoke grenades more than once without reloading. Projected smoke systems are being improved by changing from bulk-filled to submunition designs. The new design yields a several fold improvement in obscuration effectiveness for the same quantity of munitions. The M259 2.75 inch smoke rocket, M825 155mm smoke projectile and M819 81mm smoke mortar cartridge are examples of the submunition concept. Large area screening capability is being improved through recently fielded mobile smoke generators mounted on M113's and HMMWV's (M1059 and M157, respectively). Development is underway on Large Area Screening Systems (LASS) with visual, infrared and millimeter wave screening capabilities (XM55/56/57). The XM56 Smoke (LASS)/DECON System will also be capable of decontaminating chemical warfare agents.

CONTRACTORS:

AAI Corp. (Combat Vehicle Defense Obscurants System development) - (Towson, MD)
MRC Division of Chamberlain Manufacturing Corp (XM55/56/57 Full Scale development) - (Hunt Park, MD)
Minowitz Manufacturing Corp. (M157 production) - (Detroit, MI)
Tierney (Turbines for XM55/56/57 development) - (Detroit, MI)
Engineered Air Systems Inc. (M157 production) - (St. Louis, MO)

The Combat Service Support mission area relates to providing tactical commanders with supply, maintenance, personnel and administration, civil affairs, medical, transportation, and other services. In terms of equipment modernization of the force, this handbook includes those major items that the Army is developing to improve its tactical transportation capability.

COMBAT SERVICE SUPPORT

High Mobility Multipurpose Wheeled Vehicle (HMMWV)

MISSION:

The HMMWV is a light, highly mobile, diesel powered, 4-wheel drive tactical vehicle that uses a common 1 1/4 ton payload chassis. The HMMWV can be configured through the use of common components and kits to become a cargo/troop carrier, armament carrier, S250 shelter carrier, two or four litter ambulance, or TOW missile carrier. The HMMWV provides a successor to the 1/4 ton Jeep, M718A1 Ambulance, 1/2 ton M274 Mule, 1 1/4 ton Gamma Goat, and M792 Ambulance. The HMMWV is a Tri-Service program that also provides vehicles to satisfy Marine Corps and Air Force requirements. The HMMWV program is complementary to the 1 1/4 Ton Commercial Utility and Cargo Vehicle (CUCV) Non-development Item (NDI) program. Other developmental models include prime mover for the light howitzer and towed VULCAN systems.

CHARACTERISTICS:

	Cargo/Troop Carrier	Armament Carrier	TOW Carrier	Ambulance Carrier	S250 Carrier	MSE* Carrier
Curb Weight	5200	5960	6051	7180	5424	5374
Payload, lbs	2500	1940	2049	1420	3176	3148
GVW, lbs	7700	7900	8200	8600	8600	8660
Crew/Cab	2/4	4	4	2/4(litters)	2	2
Length, inches	180	180	180	201	188	194.4
Height, inches	69	73.5	71w/o Lncher	100	104	105
Width, Inches	85	85	85	85	85	85

Trailer Towing Capacity: 3400 lbs
Range: 300 miles

SOVIET COUNTERPART:

No known Soviet counterpart.

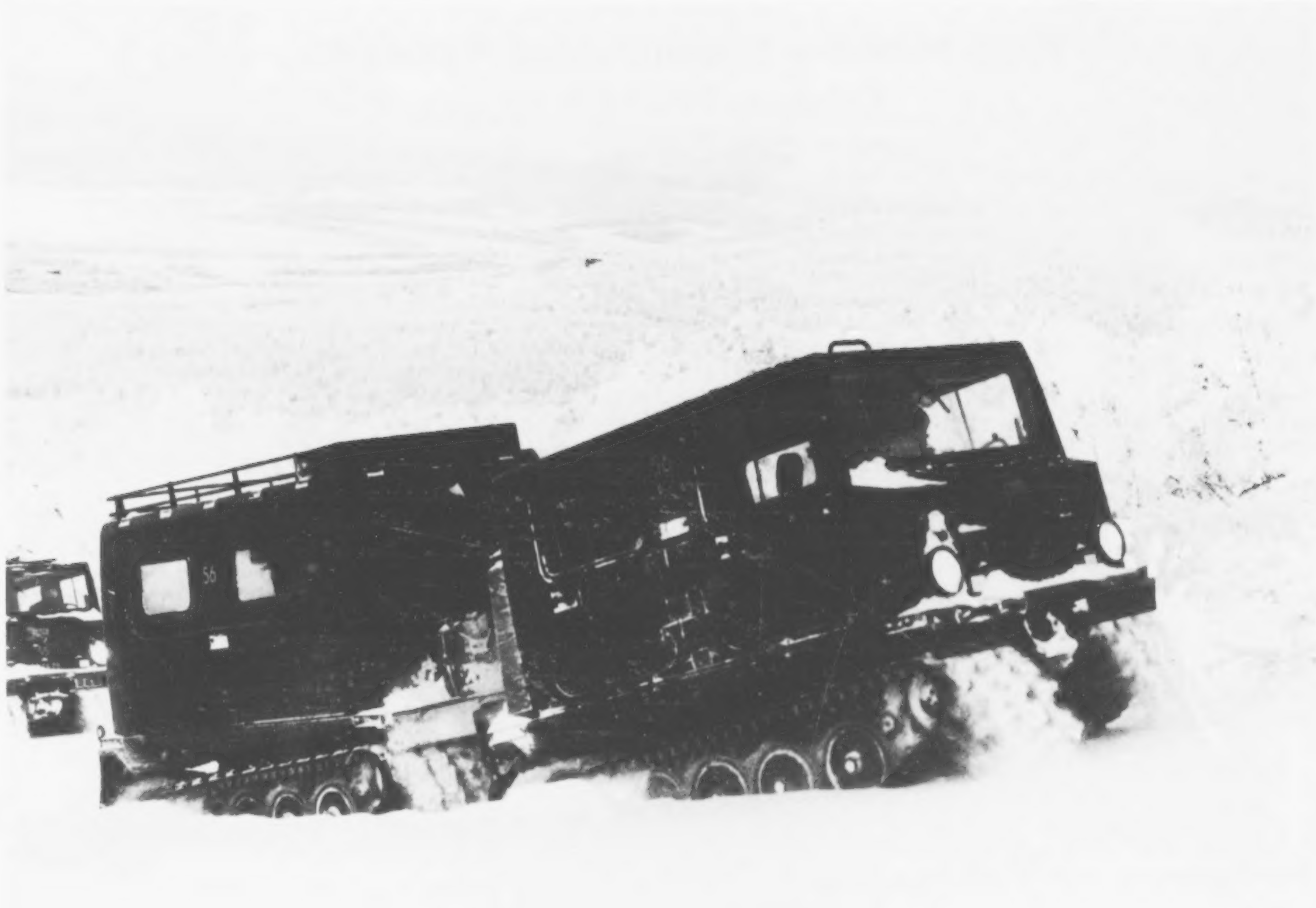
PROGRAM STATUS:

In 1983 a 5-year multiyear contract was awarded for a basic quantity of 54,973 vehicles (all Services) with an option to increase production by 100%. A new 5 year competitive multiyear contract for approximately 36,000 vehicles is planned for award in FY89.

*Special variant for Mobile Subscriber Equipment. Built by AM General for Prime Contractor (GTE) of MSE.

CONTRACTOR:

AM General Division, LTV Aerospace and Defense (Livonia, MI)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Small Unit Support Vehicle (SUSV)

MISSION:

The M973 Small Unit Support Vehicle (SUSV), 1½ Ton, is a full tracked logistical support vehicle. There are four versions, a cargo variant, an ambulance variant, command and control variant as well as a flat bed variant; all are highly mobile and helicopter transportable. It is designed to provide mobility for units on improved roads or cross country under all-year-round conditions. The SUSV can advance over bogs and marshland during summer season as easy as it can be driven over snow and ice during winter. It is capable of being sling-lifted by CH-47C helicopter and internally by C-130 aircraft. The SUSV is used to conduct operations in northern and mountainous regions, and can carry selected items of subsistence equipment, ammunition, and supplies required by small units. It is capable of floating in fresh water, can transport 17 fully equipped soldiers or a 4,400 pound payload, and tow a trailer or light howitzer.

CHARACTERISTICS:

	First Car	Rear Car	Total
Curb Weight:	5500 lbs	3700 lbs	9200 lbs
Payload:	1300 lbs	3100 lbs	4400 lbs
Gross Weight:	6800 lbs	6800 lbs	13,600 lbs
Passengers:	5 (6)	11	16 (17)
Cargo Space:	88 cu ft	194 cu ft	282 cu ft

Length: 270 in
Height: 93 in
Width: 73 in
Max speed on roads: 31 mph
in water: 2 mph
Fording Depth: Floats

Gradeability, hard surface: 60% (31 degrees)
deep snow: 30% (17 degrees)
side slope: 90% (40 degrees)
Ground pressure: 1.8 psi

Armament: None

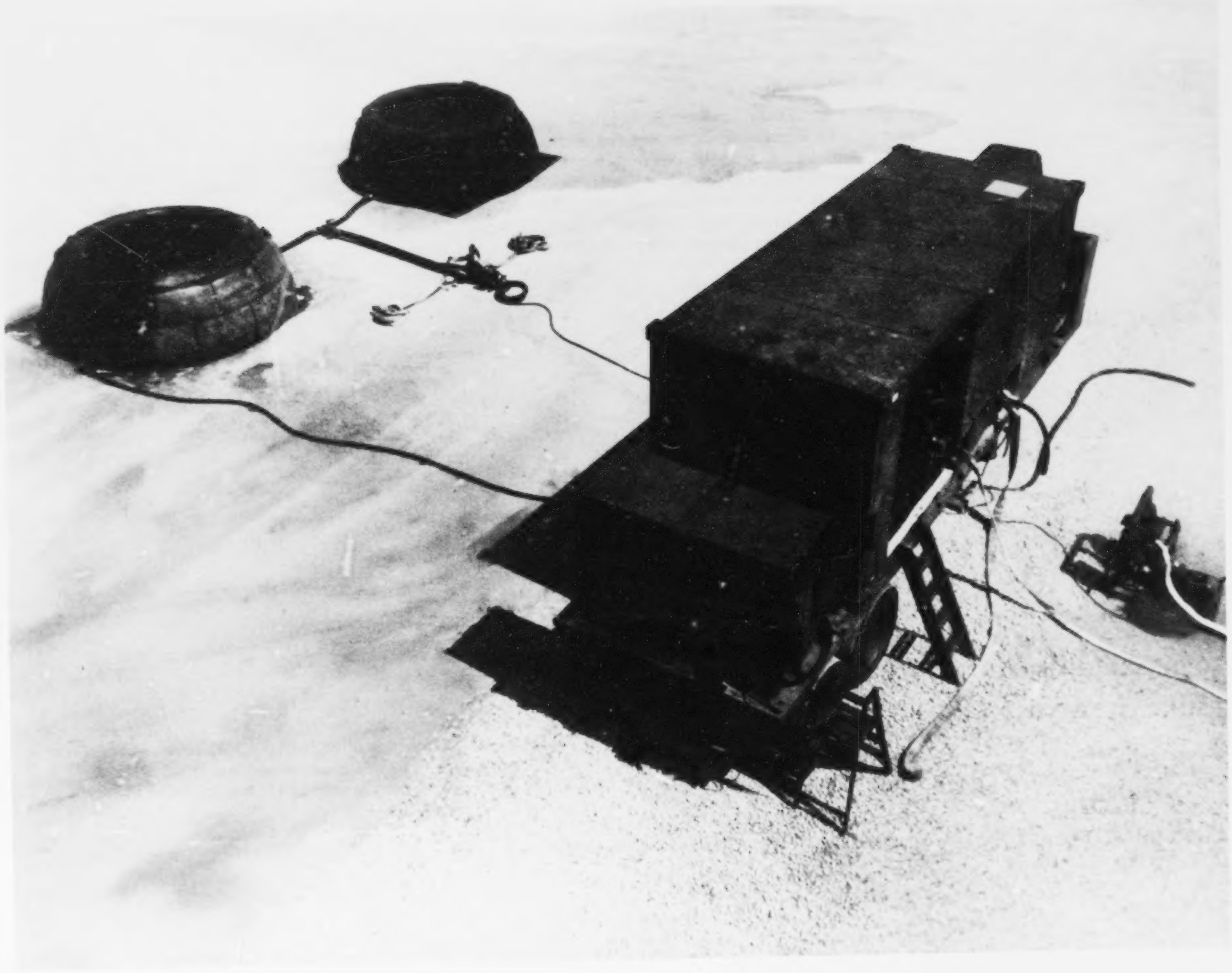
In Service for Armies In: United States (1983), Canada, Germany, Italy, Great Britain, Norway, Finland, Spain, and Sweden

SOVIET COUNTERPART: None.

PROGRAM STATUS:

The SUSV is a Nondevelopmental Item (NDI) program. The first production contract was awarded for 268 vehicles in March 1983. An option for an additional 34 vehicles was exercised in June 1983. Vehicles procured under the initial contract have been delivered and fielded. A new source 2 year multiyear contract was awarded in June 1988 for 384 vehicles. Including contract options, the Army plans to purchase up to 850 vehicles under the new contract.

CONTRACTOR: Hagglund Vehicle AB, (Ornskoldsvik, Sweden.)



Reverse Osmosis Water Purification Unit (ROWPU) 3000 Gallons Per Hour (GPH)

MISSION: The 3000 GPH Reverse Osmosis Water Purification Unit (ROWPU) provides fresh drinking water worldwide. The ROWPU purifies fresh, saline, brackish, and nuclear, biological, and chemical (NBC) contaminated water.

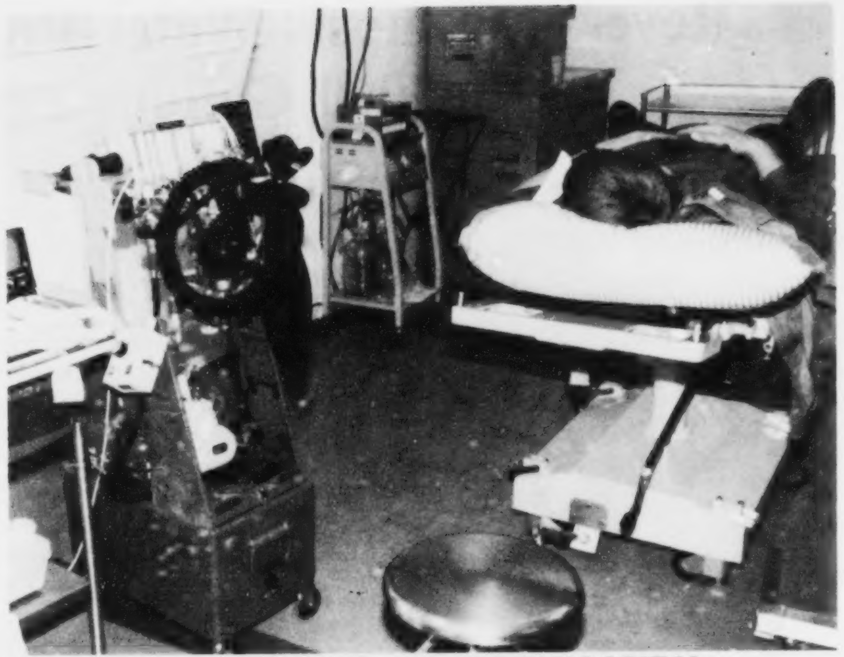
CHARACTERISTICS: The 3000 GPH ROWPU represents state-of-the-art technology in water purification equipment. The unit consists of a raw water subsystem, clarification subsystem, reverse osmosis (RO) subsystem, NBC post treatment subsystem, chemical feed subsystem, process control station, piping, fittings, and a storage area for pumps and operating supplies. The chemical feed, clarification, RO, and NBC post treatment subsystems, along with the process control station, is enclosed in a 8 foot wide by 8 foot high by 20 foot long ISO container. Support system components of the system include collapsible water storage tanks, hoses, chemicals, tools, distribution and raw water pumps, a 60KW generator set and a M871 semitrailer. This equipment is designed to operate 20 hours a day at a production rate equivalent to 3000 gallons per hour of fresh water and 2000 gallons per hour of sea water. The unit is transportable by two C-230's, one C-141, rail, ship, or standard military vehicles. The ROWPU replaces the the erdlator which can purify only fresh water.

SOVIET COUNTERPART: The Soviets currently utilize two pieces of equipment to accomplish the task for which the United States has developed the ROWPU. To purify fresh water and NBC contaminated water, the Soviets currently use the MAFS-3, a unit similar to the erdlator. To purify brackish or saline water, the Soviets utilize distillation process equipment, called the OPS, incorporated into their current standard desalinization equipment.

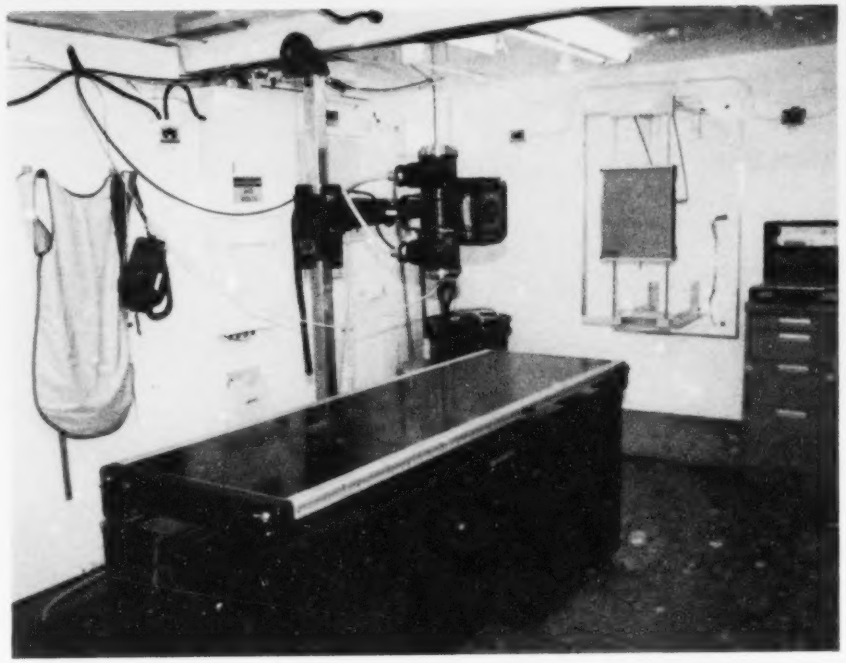
PROGRAM STATUS: The initial production contract for the 3000 GPH ROWPU has been awarded. The follow-on contract will be fully competitive.

CONTRACTOR: Aqua Chem, Inc. (Milwaukee, WI)

400 BED EVACUATION HOSPITAL DEPLOYED IN A FIELD ENVIRONMENT



PATIENT AWAITING TREATMENT IN HOSPITAL OPERATING ROOM MODULE



DEPMEDS

DEPLOYABLE X-RAY MODULE

Deployable Medical Systems (DEPMEDS)

MISSION:

DEPMEDS equipped hospitals are standard Department of Defense modular hospitals for use throughout a wartime theater of operations. There are seven types of Army hospitals, ranging from forward deployed MASH (Mobile Army Surgical Hospital) units in the combat zone to general hospitals in the Communications Zone (COMMZ). Each is composed of different configurations of standard modules such as operating rooms, laboratories, X-ray units and wards. The DEPMEDS hospitals standardize the use of the latest medical technology and equipment, expendable supplies, and major non-medical support equipment (power units, TEMPER (Tent Extendable Modular Personnel) tents, tactical shelters, and heating and air conditioning) throughout the Department of Defense. Standard modules improve medical unit mobility and patient distribution densities. The hospitals can be deployed under all climatic conditions. The fielding of the 156 Army hospitals will eliminate serious shortages of field medical equipment and achieve major advances in equipping the Total Army. Gaining units will receive their DEPMEDS equipment in one package under the Total Package Fielding concept. This is the largest Total Package fielding effort ever undertaken by the Army Medical Department.

CHARACTERISTICS:

System characteristics vary by type of hospital. All meet the systems criteria of providing adequate but austere care, being affordable, maintainable, relocatable, having modular configuration and quad-service compatibility, and being transportable by strategic air.

SOVIET COUNTERPART:

There is no known Soviet counterpart to DEPMEDS.

PROGRAM STATUS:

The DoD Medical Standarization Board insures compatibility among the Services. The Army program is managed by the DEPMEDS Project Manager, operating under the authority of the Secretary of the Army. DEPMEDS hospitals are being procured and fielding began in the 4th Qtr FY87. By the end of FY88, 14 hospital sets had been fielded to Army combat hospital units.

CONTRACTORS:

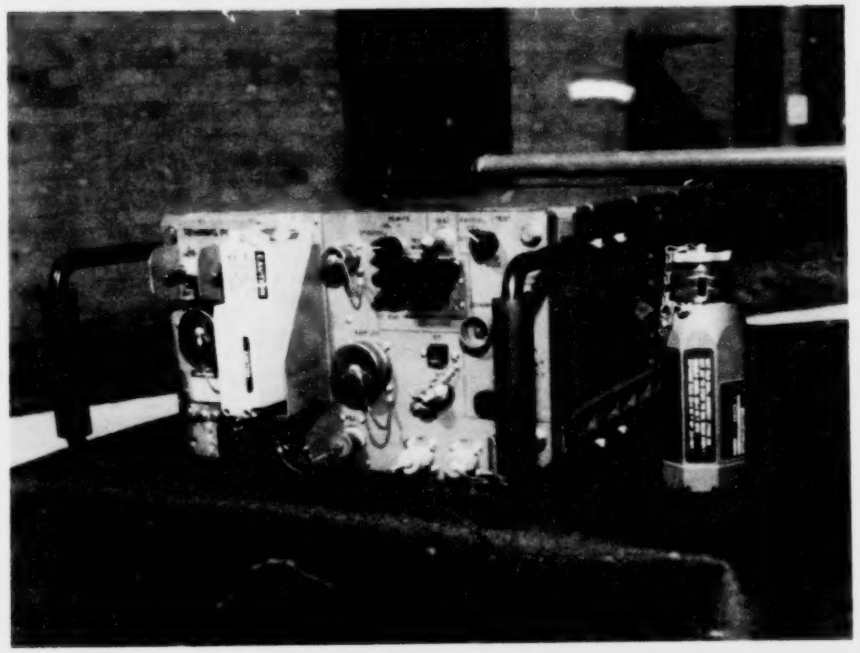
A large number of contractors are involved in providing the 3,400 plus medical and non-medical components of DEPMEDS. These components are assembled into modules and hospital sets at the Defense Depot, Ogden, Utah.

The Tactical Command, Control and Communications (C^3) mission area includes resources for providing effective command and control, automation, and communications support to combat units. In order for a commander to effectively control his tactical elements, he must know where they are located and must have a means by which to talk to them even in an enemy electronic countermeasure environment. The systems included in this mission area provide that capability. Without them, the Army would be as helpless as a person without a nervous system.

COMMAND, CONTROL, AND COMMUNICATIONS (C^3)

ARMY DATA DISTRIBUTION SYSTEM (ADDS)

ENHANCED PLRS USER UNIT
(LOW SPEED DATA DISTRIBUTION)



JTIDS CLASS 2M TERMINAL
(HIGH SPEED DATA DISTRIBUTION)

Army Data Distribution System (ADDS)

MISSION: The Army Data Distribution System (ADDS), formerly called the PLRS (Position Location Reporting System (PLRS)/Joint Tactical Information Distribution System (JTIDS) Hybrid (PJH), will modify, combine, and integrate components of PLRS and JTIDS in an evolutionary five-phase program to take advantage of the advanced state of development of these two projects. The ADDS will support Army near real time data distribution requirements in the Division and Corps area. The ADDS contains three primary equipment elements: Enhanced PLRS User Units (EPUU), JTIDS terminals, and Net Control Stations (NCS). The EPUUs are assigned to almost all units in the Division area that participate in near real-time data communications, identification and position location/navigation. JTIDS terminals will be assigned to those users whose data throughput requirements exceed the capability of the EPUU and who participate heavily in interservice communications. For example, air defense users pass high volume tracking data internally and exchange friendly identification information with the Air Force. The NCS provides overall system network managment. The ADDS system will support data communications requirements in the five functional areas of fire support, air defense, intelligence/electronic warfare, maneuver control and combat service support. The FAAD C2I (Forward Area Air Defense Command Control & Intelligence) System is totally dependent on ADDS for data distribution.

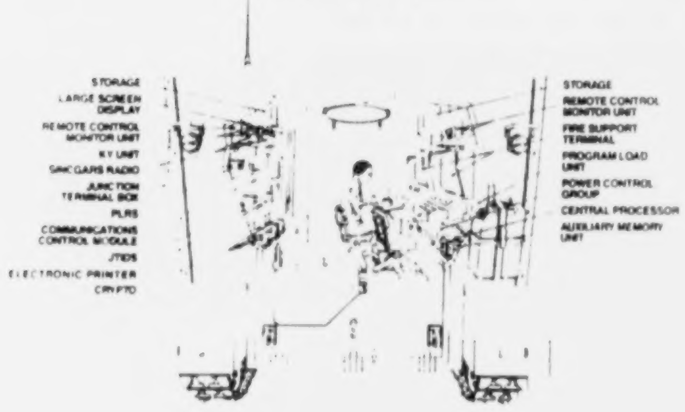
SOVIET COUNTERPART: None known.

PROGRAM STATUS: ADDS entered its final phase of development in 1985 with a final low rate production award scheduled for March 1989.

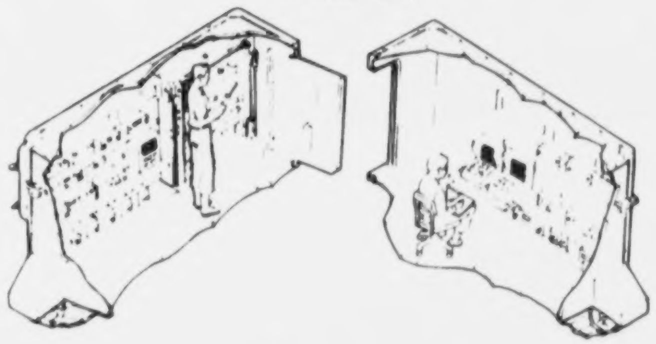
CONTRACTORS: Hughes Aircraft Company, Ground Systems Group (Fullerton, CA)
The Singer Company, Kearfott Division (Little Falls, NJ)

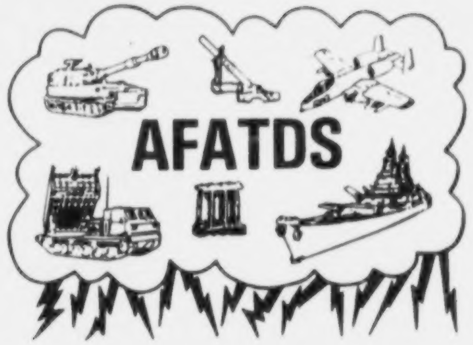
ADVANCED FA TACTICAL DATA SYSTEM

AFATDS
TYPICAL AFSC LAYOUT
(MOUNTED)


STORAGE
LARGE SCREEN DISPLAY
REMOTE CONTROL MONITOR UNIT
KY UNIT
SINCGARS RADIO
JUNCTION TERMINAL BOX
PLRS
COMMUNICATIONS CONTROL MODULE
JTIDS
ELECTRONIC PRINTER
CRYPTO
STORAGE
REMOTE CONTROL MONITOR UNIT
FIRE SUPPORT TERMINAL
PROGRAM LOAD UNIT
POWER CONTROL GROUP
CENTRAL PROCESSOR
AUXILIARY MEMORY UNIT

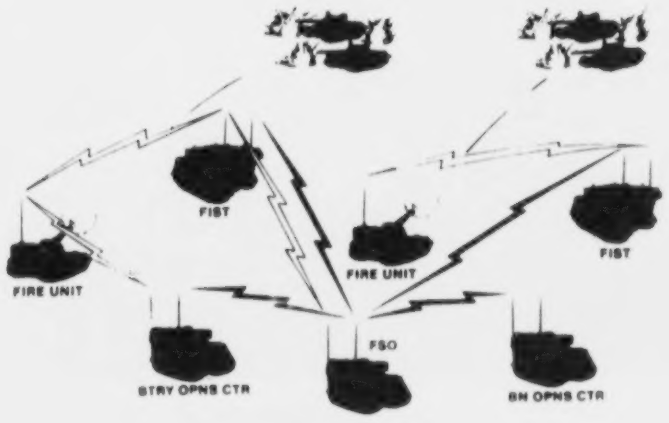
AFATDS
TYPICAL AFSC LAYOUT
(VEHICULAR)





- STATE OF THE ART TOTAL FIRE SUPPORT SYSTEM
- DISTRIBUTED PROCESSING
- USES ARMY COMMON (ATCCS) HARDWARE
- FIRST UNIT EQUIPPED 2D QTR FY 92

AFATDS 1990's


FIST
FIRE UNIT
FIRE UNIT
FIST
FSO
BTRY OPNS CTR
BN OPNS CTR

Advanced Field Artillery Tactical Data System (AFATDS)

MISSION: AFATDS will replace and will broaden and modernize the US Army fire support Command, Control and Communications (C3) TACFIRE system. It will meet automated fire support requirements of the Army Tactical Command and Control System (ATCCS) during the 1990-2010 timeframe. AFATDS will support close, rear and deep operations and nuclear, non-nuclear and chemical fire planning. It will coordinate the employment of all Service/Combined fire support assets to complement the commander's scheme of manpower. Compatibility will be provided with all existing and planned US and allied field artillery system and sensors. The AFATDS will also correct the fire control and distribution deficiencies of the current TACFIRE system with no increase in personnel requirements, with greatly reduced side, and minimized training burden. AFATDS will provide fully automated support for planning, coordination and control of all fire support assets (mortars, close air support, naval gunfire, attack helicopters, offensive electronic warfare, field artillery cannons, rockets and guided missiles) in the execution of close support counterfire, interdiction, suppression of enemy air defense and deep operations.

PROGRAM STATUS: There will be a milestone III decision on AFATDS in FY89. FY90 activities include continued Full Scale Development of Fire Support software, continued system integration and test with the ATCCS CHS and also development of installation kits and accessories to support test and initial fielding of AFATDs.

SOVIET COUNTERPART: The Warsaw Pact has fielded an artillery tactical command and control system. This system has computers at battery, battalion and regiment or brigade level that are digitally linked. These computers perform fireplanning, targeting, logistics and terrain management calculations.

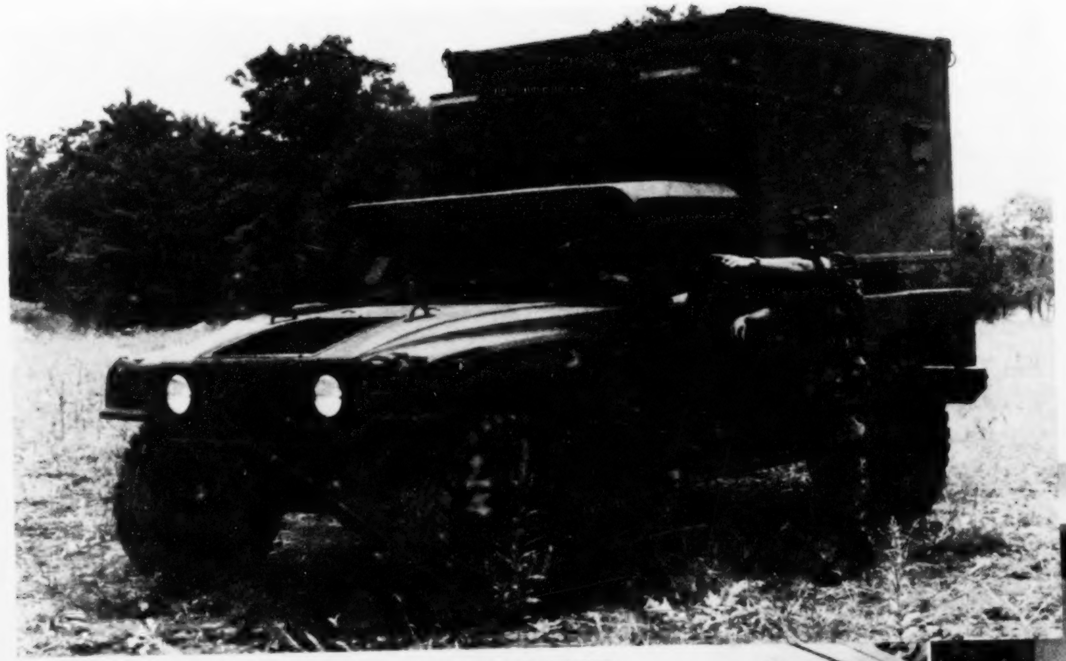
CONTRACTOR: Magnavox (Ft. Wayne, IN)

Joint Tactical Communications Program

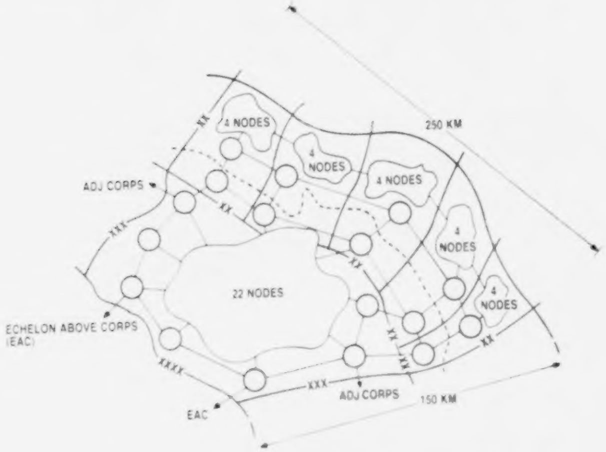
The Joint Tactical Communications Program is a joint service and DOD Agency program to develop and field advanced tactical multichannel switched communications equipment. This equipment will provide the combat forces with the tactical communications needed to meet the mobility, security and reliability requirements of the modern battlefield. This program was established to achieve interoperability between service tactical communications systems, interoperability with strategic communications systems, take advantage of recent advances in technology, and eliminate duplication in service developments. Each component of the program is assigned to one of the services to develop and acquire for all of the defense community. The major components assigned to the Army are the AN/TTC-39 family of switches, the AN/TYC-39 Message Switch, multichannel transmission equipment and user message processing devices.

AN/TTC-39 Circuit Switch and AN/TYC-39 Message Switch

MISSION:	This equipment provides automatic switching service, interconnecting analog and digital users, between tactical and Defense Communication System switches, and between US and NATO national switches. Both switches employ micro-electronic components and design techniques to minimize size, weight, and power consumption. The AN/TTC-39 system is the heart of the multichannel switched network and is a highly efficient means of connecting telephones, message traffic, and data users in both a secure and nonsecure mode in the area network at echelons above Corps.
SOVIET COUNTERPART:	There is no known counterpart.
PROGRAM STATUS:	Both switches were authorized for production in FY80. Fielding of these switches was accomplished in FY86. The Army is currently fielding the improved AN/TTC-39A Circuit Switch. Fielding is to be completed second quarter, FY95.
CONTRACTOR:	GTE Sylvania (Needham Heights, MA)

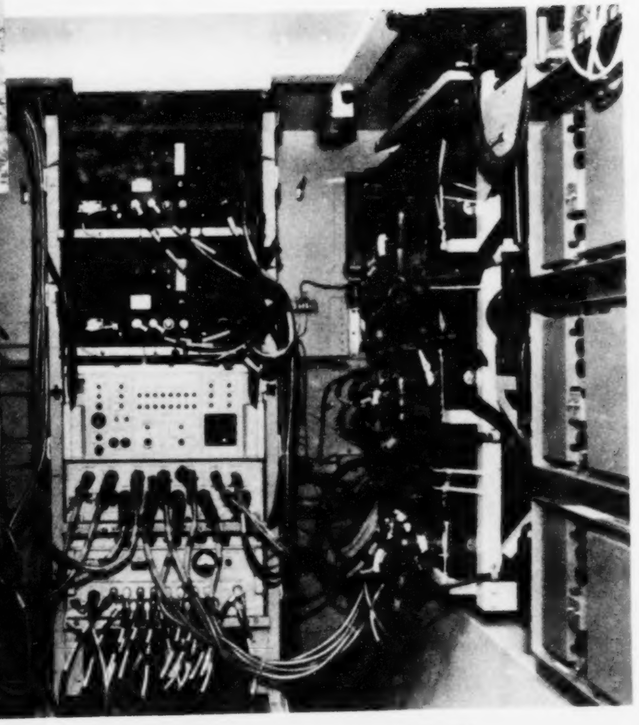


HMMWV WITH S250 SHELTER


250 KM
4 NODES
4 NODES
4 NODES
4 NODES
4 NODES
ADJ CORPS
XX
XX
XX
XX
XX
XXX
XXX
XXXX
22 NODES
ECHELON ABOVE CORPS (EAC)
EAC
ADJ CORPS
150 KM

MSE Deployment - 42 nodes

- 4 nodes per division
- 22 nodes per corps



RADIO ACCESS UNIT (INSIDE SHELTER)

Mobile Subscriber Equipment (MSE) Program

MISSION:

The Mobile Subscriber Equipment (MSE) is an area communications system which will be fielded in the Corps and division areas. MSE provides secure static and mobile (on the move) voice/data/facsimile service to principal commanders and key staff officers enabling them to exercise command and control over their forces in the rapidly changing battlefield environment. (An approximate commercial equivalent is a telephone system with mobile radio telephone service and data capability.) The Corps network consists of 5 divisions which are composed of 42 nodes and will provide service to 1900 mobile and 8,500 static subscribers. MSE is interoperable with TRI-TAC, combat net radios, commercial telephone, and NATO systems. It allows users to keep the same telephone number as they move on the battlefield and will automatically route calls around inoperable nodes. Since market surveys determined that MSE-type systems were already available, the Army decided to follow a non-developmental item (NDI) acquisition strategy to save time, money, and personnel; that is, to accept the best available system.

SOVIET COUNTERPART:

There is no known Soviet counterpart.

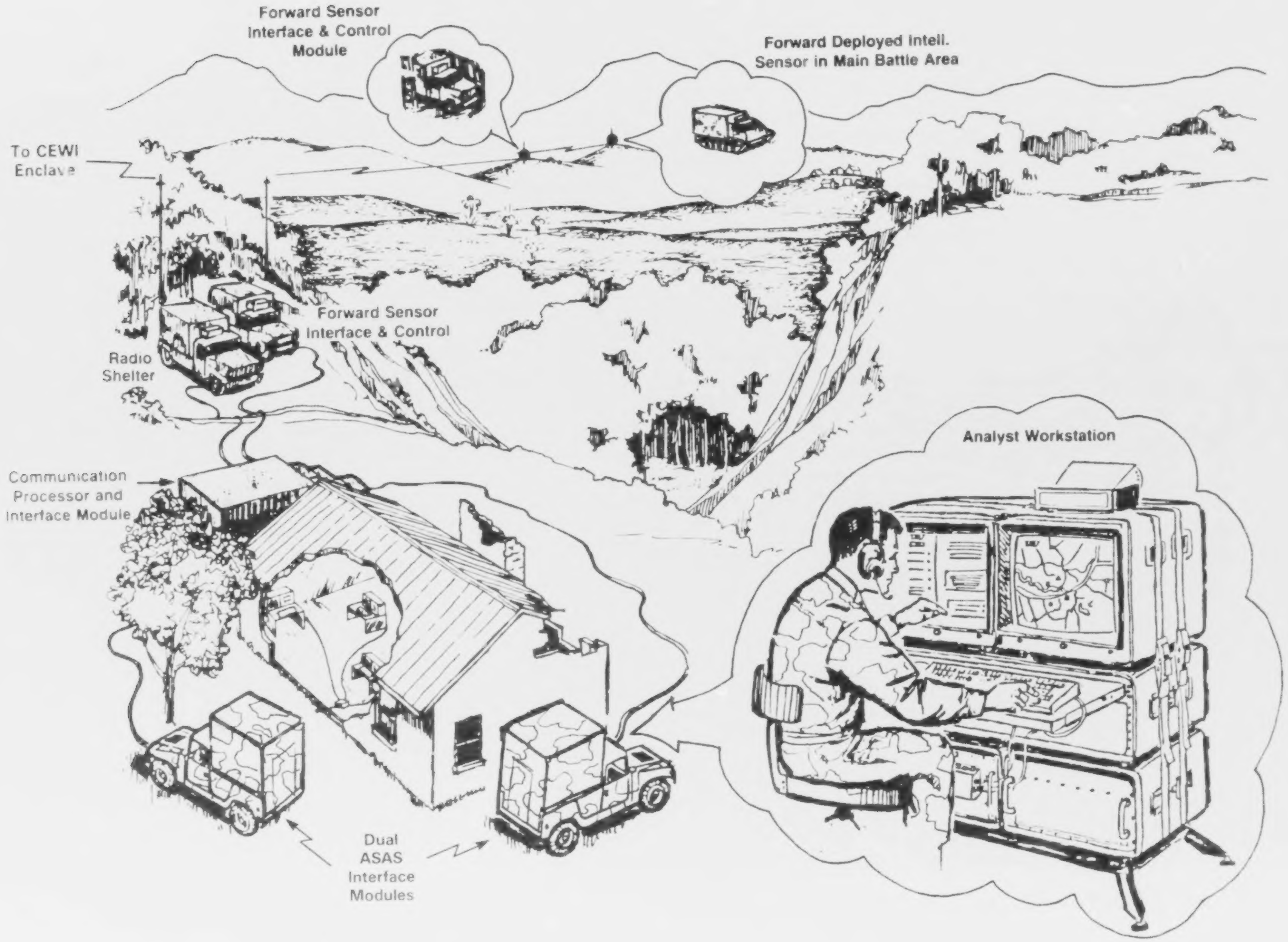
PROGRAM STATUS:

The MSE program is progressing according to the planned acquisition strategy. The basic MSE contract and the 1st Option were awarded in FY86, the 2d Option in FY87, and the 3rd option in early FY89. The 3rd Option represented the advancement to full rate production. Procurements from these four awards will equip and field 12 corps signal battalions, eleven division signal battalions with associated MSE division equipment, and the Fort Gordon and Fort Sill training bases. A successful Follow-On Operational Test and Evaluation of MSE was concluded in November 1988. The results of this test showed that MSE is operationally effective and significantly better than currently fielded area communications equipment. Funding in FY89 and FY90 will procure another 15 division sets and eight corps sets. The FY91 procurement will equip two divisions and will complete the buy for the current Army Acquisition Objective.

CONTRACTOR:

GTE selected by competitive process.

ALL SOURCE ANALYSIS SYSTEM


Forward Sensor Interface & Control Module
Forward Deployed Intell. Sensor in Main Battle Area
To CEWI Enclave
Forward Sensor Interface & Control
Radio Shelter
Analyst Workstation
Communication Processor and Interface Module
Dual ASAS Interface Modules

All Source Analysis System (ASAS)

MISSION:

The All Source Analysis System (ASAS) can be described as the central nervous system guiding field commanders to successfully prosecute the AirLand Battle/Deep Attack. A Tactical key sub-element of the Army Command and Control System (ATCCS), the ASAS will automate command and control of Intelligence/Electronic Warfare (IEW) operations. It will also generate a near real-time picture of the enemy situation to guide employment of maneuver forces and systems such as the Joint Surveillance and Target Acquisition Radar System (JSTARS) and the Army Tactical Missile System (ATACMS). Many sophisticated sensor systems provide targeting information, yet today the capability to process and respond to that information is limited by manual and partially automated methods. The ASAS will use state-of-the-art minicomputers to speed the process and improve its accuracy. The Joint Tactical Fusion Program is developing ASAS along with the Air Force Enemy Situation Correlation Element (ENSCE). The ASAS/ENSCE architecture is modular. Division ASAS, Corps ASAS, and ENSCE systems will be configured differently, in accordance with force structure and mission requirements.

SOVIET COUNTERPART:

No known Soviet counterpart.

PROGRAM STATUS:

The program employs an evolutionary acquisition strategy. Initial system components will be fielded in the late 1980's, and the objective system will evolve through pre-planned product improvements and software refinement based on user feedback. Testing of system modules began in FY86 and continued through FY88. Fielding of Limited Capability Configuration at III Corps will start in FY89. Following a successful Initial Operational Test and Evaluation (IOTE), a milestone III production decision is scheduled for FY92, and full production systems will commence in the early 1990s.

CONTRACTORS:

Jet Propulsion Laboratory (Pasadena, CA)
Martin Marietta Corporation (Denver, CO)
Ford Aerospace and Communications Corporation (Palo Alto, CA)
TRW (Redondo Beach, CA)
McDonnell Douglas (Huntington Beach, CA)

Single Channel Ground and Airborne Radio System (SINCGARS-V)

MISSION:

SINCGARS provides commanders with a reliable, easily maintained Combat Net Radio (CNR) for command and control. SINCGARS provides effective Electronic Counter-Counter Measures (ECCM) against threat Electronic Warfare (EW). SINCGARS configurations include manpack, vehicular (both low and high power), and airborne models. The first radios fielded do not contain integrated communications security (COMSEC) but, instead, will use the external VINSON COMSEC device. COMSEC will be integrated in later verions of the ground and airborne models (ICOM SINCGARS). SINCGARS radios have greatly improved reliability over the AN/VRC-12 series radios which they replace, and they are exceeding the requirement of 1250 hour Mean Time Between Failure (MTBF).

CHARACTERISTICS:

Weight:	22.5 lbs w/battery and COMSEC Device
Frequency Range:	ICOM weight 19.6 lbs w/battery
	30.00 to 87.975 MHz
Channels:	2320
Range:	8-35 km

SOVIET COUNTERPART:

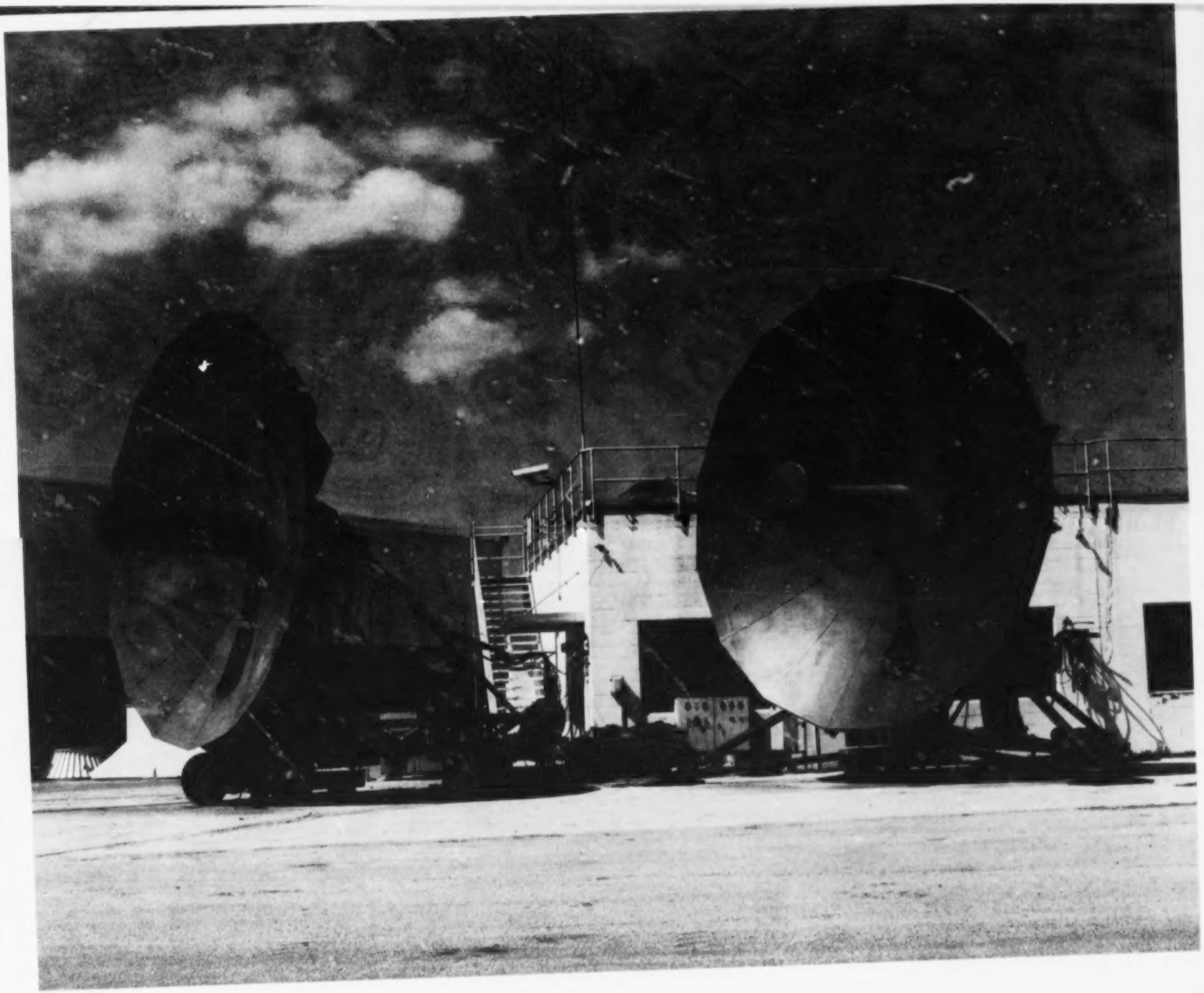
The Soviets have no known counterpart.

PROGRAM STATUS:

First source SINCGARS ground radios passed First Article Tests in January 1988 and production deliveries began immediately. A Follow-on Operational Test and Evaluation was completed in May 1988. Awards for Options 3 and 4 for 16,000 radios each are scheduled for March 1989 and 1990 respectively, completing the first source contract for 44,100 ground radios. Of this quantity, 27,625 will have integrated COMSEC (ICOM). All SINCGARS produced after FY89 will be ICOM SINCGARS. A second source of ICOM SINCGARS ground radios was selected and a firm fixed price contract was awarded in July 1988 with two options for FY90 and FY91. Full competition will begin in FY92. The 2d Infantry Division in Korea received 145 SINCGARS radios in December 1987, providing commanders with jam-resistant communications for their DMZ forces. Since then, the program office has fielded 290 radios to the training base. Limited fielding to Army units in SOUTHCOM is planned. Major unit fielding will begin in January 1990. The SINCGARS airborne radio passed First Article Tests in September 1988. There are options on the airborne radio contract for FY89 and FY90. Airborne radios will be field concurrently with the ground radios.

CONTRACTORS:

First Source: (ground and airborne radios): ITT Aerospace/Optical Division (Fort Wayne, IN).
Second Source (ground radios): General Dynamics Electronics Systems (San Diego, CA)



Satellite Communications Programs

MISSION:

The Army's Satellite Communications Program consists of the Ground Environment of the Defense Satellite Communications System (DSCS) and the Ground Mobile Force Tactical Satellite Communication Program. DSCS provides unique and vital communications for the Department of Defense and other U.S. Government agencies. As its share of the DSCS program, the Army develops, procures, and fields ground satellite communications earth terminals and control systems for all the armed services. These terminals and control systems support rapid, reliable, effective worldwide command, control, communications and intelligence operations of military commanders, and the National Command Authority. Developments are underway to maximize traffic rates, increase effective use of scarce satellite resources, provide cost effective system control, and minimize vulnerability to enemy countermeasures. The Ground Mobile Forces Tactical Satellite Communication Program provides single channel, multi-channel and special purpose tactical satellite ground terminals and control systems to meet critical long range, jam-resistant and nuclear survivable communications needs. The Army is procuring the single channel AN/PSC-3 and AN/VSC-7 Ultra High Frequency (UHF) terminals for Ranger and Special Forces users. Additionally, fielding of multichannels, Super High Frequency (SHF) AN/TSC-85A and AN/TSC-93A satellite communications terminals are continuing. Full Scale Development is underway to provide the highly survivable, anti-jam and mobile ground terminal—the Single Channel Objective Tactical Terminal (SCOTT)—for the MILSTAR Satellite Communications System. SCOTT will operate in the Extremely High Frequency (EHF) range.

SOVIET COUNTERPART:

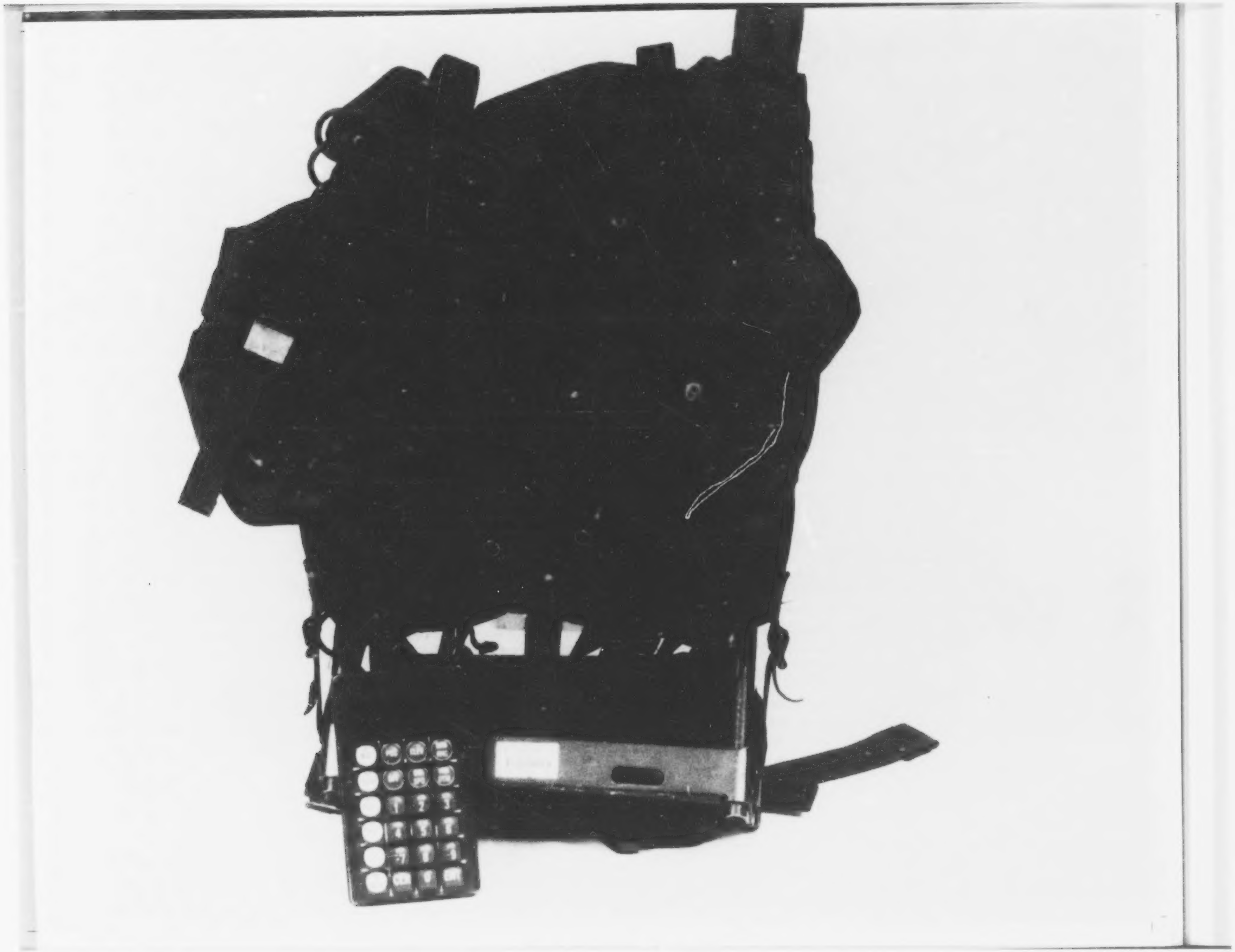
The Soviet Union possesses a large strategic satellite network, based upon use of the MOLNIYA and STATSIONAR satellites. The Soviets rely on high frequency (HF) radio or less survivable UHF and SHF satellite systems for long range tactical communications.

PROGRAM STATUS:

Satellite Communication (SATCOM) will continue programs designed to upgrade the DSCS equipment and operation systems in support of strategic communication requirements. Programs include integration of the Digital Communication Satellite Subsystem into both mobile and fixed terminals, modifications to in-service equipment to improve efficiency and lower operation and maintenance costs, and development of enhanced operational systems. To support tactical Ground Mobile Forces, PM SATCOM will complete fielding of AN/TSC-85A/93A tactical SATCOM (TACSAT) terminals and begin fielding of the baseband improvement modification (BIM). Conceptual testing of the Phase I AN/TSQ-XX Satellite Control facility prototypes will be completed - development of the Phase II prototypes will begin. Requirement contracts will be established to support multiservice requirements for off-the-shelf UHF satellite manpack terminals and ancillary equipment. The NDI Category B acquisition program for the Advanced Manpack UHF Terminal (AMUT) with embedded narrow band secure voice and Demand Assisted Multiple Access (DAMA) capabilities will continue. Delivery of Single Channel Transponder Receivers for AN/MCS-64 terminals will begin. Procurement of 207 SCOTT terminals will be made between 1990-94 for Army units which support joint operations. SCOTT Initial Operation Test & Evaluation (IOT&E) will begin in August 1989.

CONTRACTORS:

Harris Corp. (Melbourne, FL)
Ford Aerospace Corp. (Palo Alto, CA)
GE Corp. (Valley Forge, PA)
M/A—Comm Linkabit Corp
(San Diego, CA)
Magnavox (Torrence, CA)



NAVSTAR Global Positioning System (GPS)

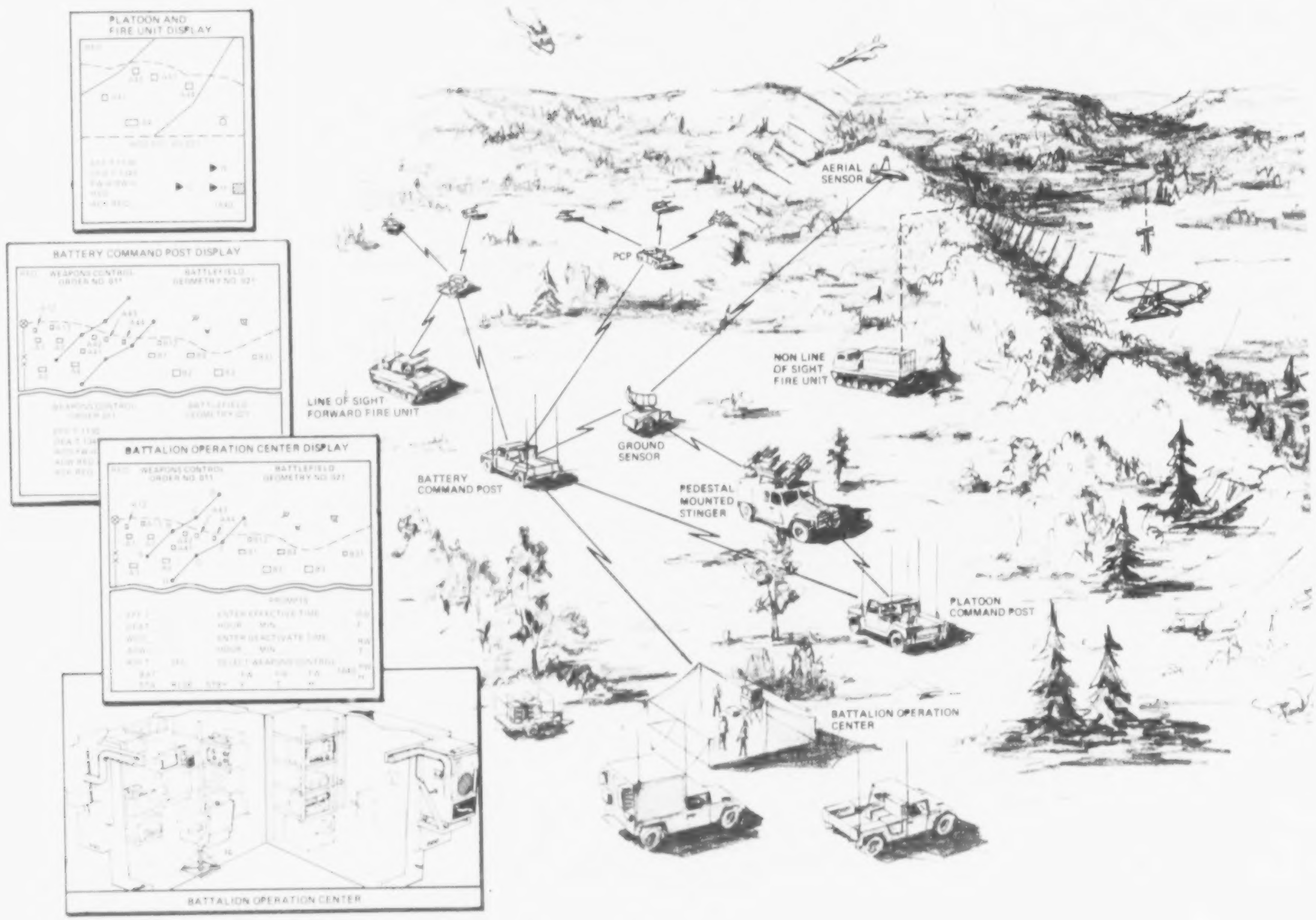
MISSION: The NAVSTAR Global Positioning System (GPS) is a joint Army, Navy, Air Force Program with the Air Force as the lead service. It is a space-based navigation, three dimensional positioning and time distribution system that will provide accurate, continuous, all-weather, common grid, worldwide navigation, positioning and timing information to land, sea, air and space-based users. GPS consists of three segments: (1) Space Segment (24) satellite constellations; (2) Ground Control Segment; and (3) User Segment. The User Segment consists of one, two and five-channel receiver configurations for manpack/vehicular, low-to-medium dynamic aircraft, and high dynamic aircraft and seacraft applications respectively. The Army will use the one and two-channel configurations and is responsible to the Joint Program Office for the testing of those receivers. The GPS receiver is a passive device that will be deployed at all echelons extensively and with Army aircraft.

SOVIET COUNTERPART: Global Navigational System (GLONAS)

PROGRAM STATUS: NAVSTAR GPS received consensus from the Joint Resources Management Board in June 1986 to proceed from the Full Scale Engineering Development phase to a Low Rate Initial Production (LRIP). Testing of the LRIP receivers will be conducted in FY89 with a full production decision made in FY90.

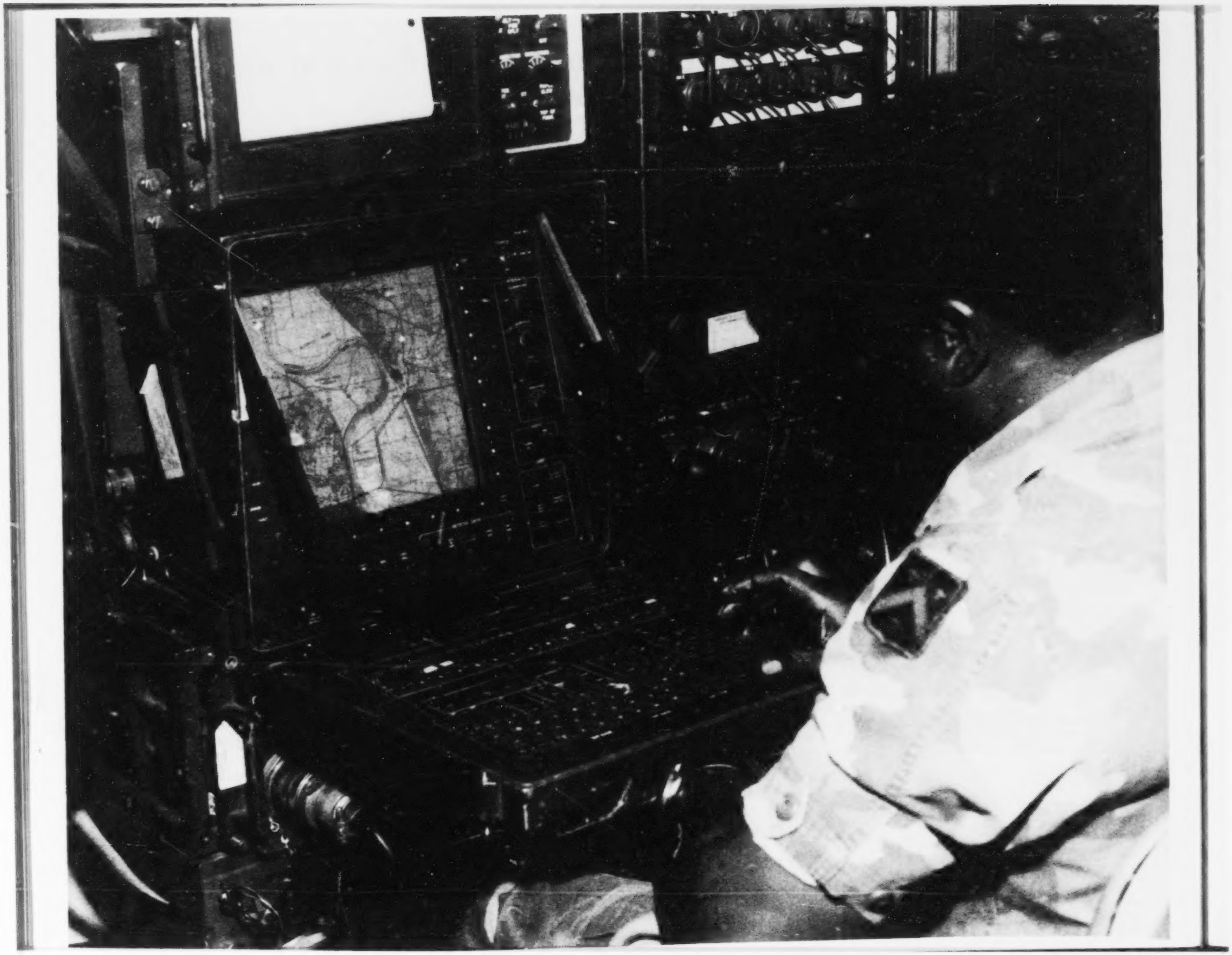
CONTRACTORS: Rockwell International, Collins Government Avionics Division (Cedar Rapids, Iowa)

Forward Area Air Defense C^2I


PLATOON AND FIRE UNIT DISPLAY
BATTERY COMMAND POST DISPLAY
BATTALION OPERATION CENTER DISPLAY
BATTALION OPERATION CENTER
AERIAL SENSOR
PCP
NON LINE OF SIGHT FIRE UNIT
LINE OF SIGHT FORWARD FIRE UNIT
GROUND SENSOR
BATTERY COMMAND POST
PEDESTAL MOUNTED STINGER
PLATOON COMMAND POST
BATTALION OPERATION CENTER

Forward Area Air Defense Command, Control and Intelligence (FAAD C2I)

MISSION:	FAAD C2I integrates the Forward Area Air Defense System into a synergistic system of systems capable of defeating the air threat to Army divisions. The distributed FAAD C2I network provides rapid collection, storage, processing, display, and dissemination of critical, time-sensitive air situation and targeting information. Weapon cueing and air situation information is developed from a suite of sensors and aircraft identification devices (ground and aerial, passive and active). The Army Data Distribution System ensures reliable, real-time, secure transfer of data between the sensors and weapons and other battlefield users. FAAD C2I provides automation for the Air Defense Control segment of the Army Tactical Command and Control System and assists battle captains in planning, coordinating, directing, and controlling the Counter Air fight. FAAD C2I also provides for interoperability with HIMAD, Joint, and Allied Air Defense Control systems.
SOVIET COUNTERPART:	The Soviets have deployed and continue to improve a very robust integrated Air Defense Command, Control and Intelligence System.
PROGRAM STATUS:	The Full Scale Development contract for systems integration and software was awarded in FY86. FY89 activities include completion of systems design, continuation of software development and ATCCS integration. Integration, Assembly and Test (IMT) will begin in FY90.
CONTRACTORS:	C2 software and development systems integration: (TRW (Prime) (Redondo Beach, CA)



Maneuver Control System (MCS)

MISSION: The Maneuver Control System (MCS) is an automated tactical command and control system that provides computer-aided decision support to tactical commanders and their battle staffs at corps through battalion levels. Army Airland battle doctrine calls for securing and retaining the initiative and exercising it aggressively in fluid, continuous, and wide-ranging operations from friendly rear area to enemy rear area. The Army Tactical Command and Control System (ATCCS) architecture has the objective of providing the necessary command and control resources for the Force Commanders at all echelons up to Corps to win on AirLand battlefield. The MCS is the objective maneuver and force level control system in ATCCS. A prototype capability was fielded in Europe (VII Corps) in 1981 as a means of obtaining user feedback and requirements refinement to support the system's evolution. In 1983, the MCS completed development and operational testing and was approved for production. The 1985 decision provided direction to initiate an integrated nondevelopment item (NDI) effort to complement the fully militarized MCS devices. In its final configuration in the mid-90's, MCS will utilize common hardware being procured for all ATCCS C2 systems.

PROGRAM STATUS: The total quantity of full militarized hardware was procured in FY86 and will continue fielding until completion in FY91. NDI deliveries began in FY89 (first to III Corps) with fielding also to be completed in FY91. Common Hardware fielding begins in FY93.

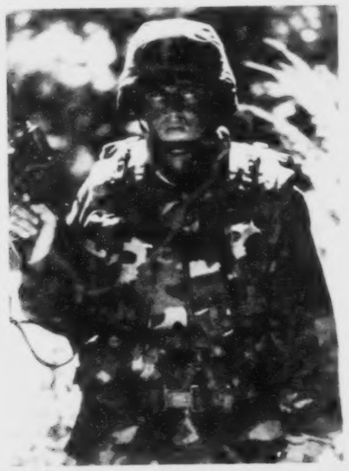
SOVIET COUNTERPARTS: There is no known comparable Soviet system.

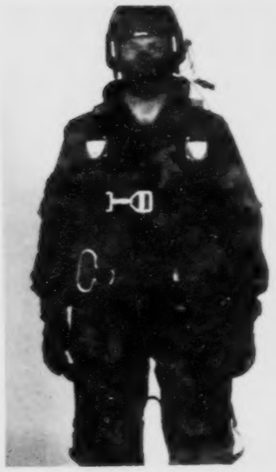
CONTRACTORS:
Singer Librascope (Glendale, CA) (militarized)
Ford Aerospace & Communications Corp. (Colorado Springs, CO) (NDI)
TRW (Redondo Beach, CA) (System Engineering and Integration)
MILTOPE (Melville, NY) (Common Hardware/Software)

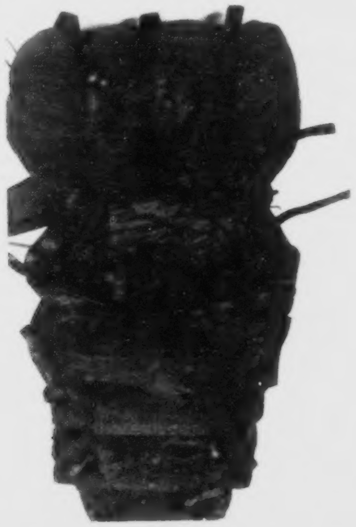
The Soldier Support mission area includes those items that directly support the individual soldier. This mission area includes organizational clothing and individual equipment, chemical-biological defense equipment, night vision devices and individual weapons (further described on the pages following). As we modernize the Army with new equipment, we must keep the individual soldier equally up-to-date.

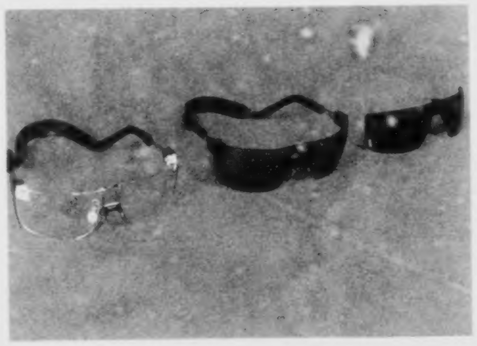
SOLDIER SUPPORT

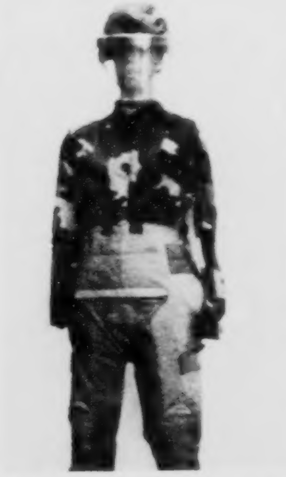
SOLDIER SUPPORT ITEMS


LOAD BEARING EQUIPMENT =
RECENTLY TYPE CLASSIFIED LOAD BEARING
EQUIPMENT PROVIDES SOLDIER GREATER
COMFORT AND LOAD TAILORING)


PARACHUTISTS ROUGH TERRAIN SYSTEM =
(DEVELOPMENT ITEM TO BE USED BY SPECIAL
OPERATING FORCES)


FIELD PACK LARGE WITH INTERNAL FRAME =
(RENCENTLY TYPE CLASSIFIED PACK TO REPLACE
ALICE PACK AND EXTERNAL FRAME)


BALLISTIC/LASER EYE PROTECTION=
(DEVELOPMENTAL ITEM TO PROVIDE SOLDIER
WITH PROTECTION FROM SMALL GRAIN
FRAGMENTS AND SELECTED LASERS)


BODY ARMOR COUNTERMINE=
(DEVELOPMENTAL ITEMS TO BE USED
TO DEFEAT SMALL MINES PRIMARILY
FOUND IN LOW INTENSITY ENVIRONMENTS)

Soldier Support

OBJECTIVES AND CHARACTERISTICS

SOLDIER SUPPORT includes several related programs which respond to changing threat requirements and advances in state-of-the-art technology to enable the soldier to fight more effectively and survive better under all battlefield conditions. These include:

CLOTHING AND INDIVIDUAL EQUIPMENT (CIE) research and development provides quality dress and personal uniforms, as well as quality and effectiveness in combat clothing and individual equipment. Currently, emphasis is placed on combat CIE to improve soldier capability to counter newly emerging battlefield threats. Research and development is focused on the design of lighter weight equipment, ballistic and laser eye protection, and improved chemical protective clothing which take advantage of the latest progress in technology and advanced materials. Over thirty projects are in progress to enhance soldier survivability and effectiveness. CIE research and development is managed by the Project Manager-Clothing and Individual Equipment, Woodbridge, Virginia. Natick Research Development and Engineering Center, Natick, Massachusetts is the Army's primary developer for CIE.

CHEMICAL-BIOLOGICAL DEFENSE (CBD) EQUIPMENT is being developed to permit the soldier to survive and continue his mission with minimal performance degradation on the chemical-biological contaminated battlefield. CBD development includes items for improved eye and respiratory protection, personal and individual equipment decontamination, collective protection and detection and warning of chemical and biological hazards. The Chemical Research, Development and Engineering Center, Aberdeen Proving Grounds, Maryland is the Army's primary developer of CBD equipment.

NIGHT VISION DEVICES allow the individual soldier to function as well during night operations as during the day. These devices enable the soldier to locate, identify, and engage targets during periods of darkness and reduced visibility (haze, fog, and smoke). Future technology will focus on miniaturizing and reducing weight of the device, while lowering life cycle costs. The objective is to make these devices available to more soldiers, while insuring that the sights are effective and convenient to use. Night vision development is conducted at the Night Vision and Electro-Optics Laboratory at Fort Belvoir, Virginia.

INDIVIDUAL WEAPONS. The M16A2 rifle (5.56mm) is an improved version of the older M16A1 rifle. The 9mm handgun will replace the older .45 cal and .38 cal pistols.

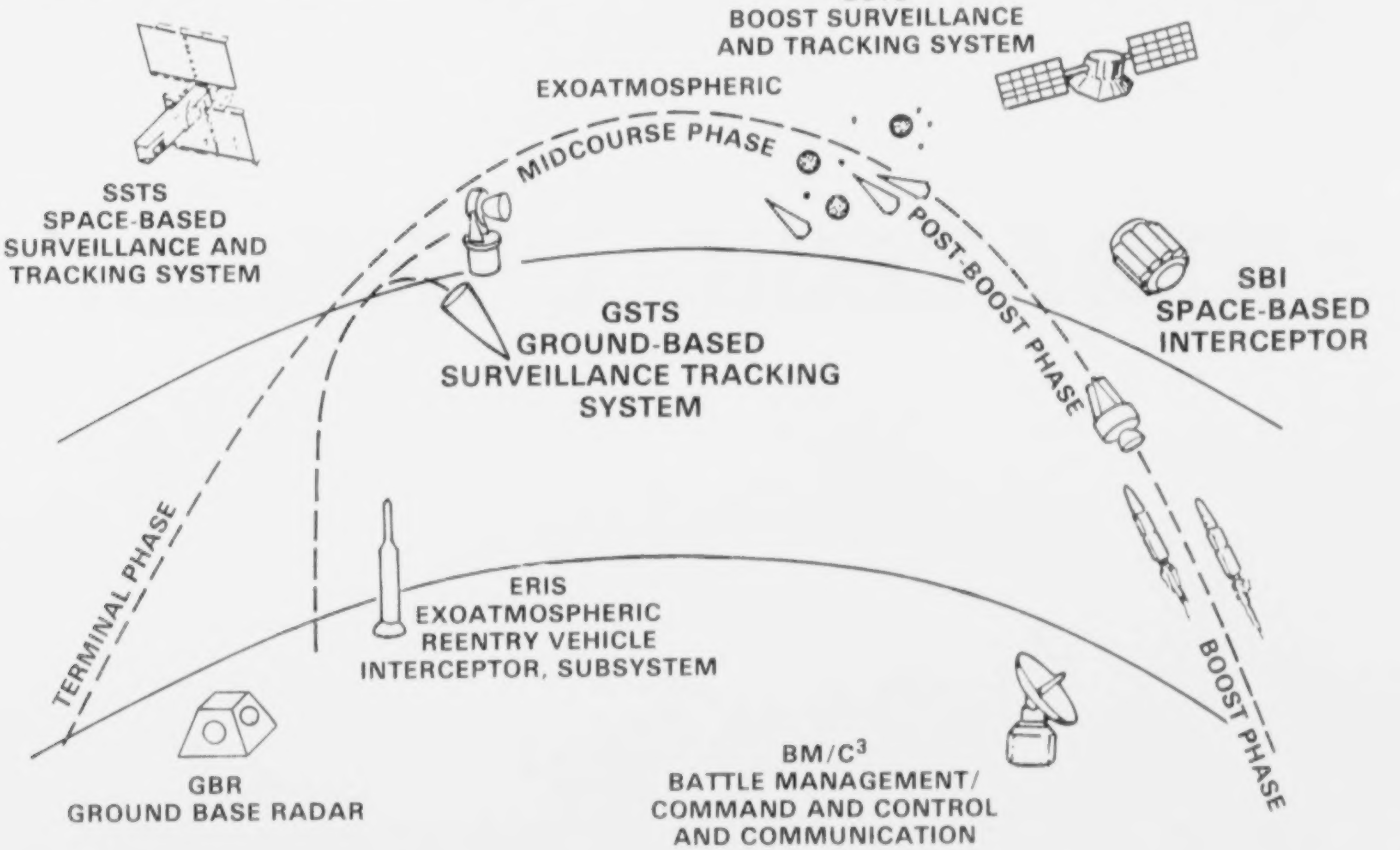
PROGRAM STATUS:

Currently there are 30 clothing and individual equipment R&D projects ongoing which have been approved by the Chief of Staff, Army. Projects include laser/ballistic eye protection, self contained chemical uniform, flechette ballistic vest, aircrew battledress uniform, aircrew cold weather uniform, snow and ice traversing equipment, and equipment airdrop containers. Also, 34 product improvements to fielded items are being worked. These include improved aircrew/CVC cooling vest, light duty leather glove, vapor barrier boot, extra large PASGT helmet, chemical/biological glove, combat boot sock, and wet weather parka/trousers. During 1989, 11 items are expected to be approved and type classified. These will include the 40 mm grenade vest, aircrew NBC uniform, extreme cold weather canteen, aircrew flight uniform, interim self contained chemical uniform, enhanced SPH4 aviator helmet, gross chemical liquid protection overgarment, laser/ballistic eye protection, aviator survival vest, snow/ice traversing equipment and sleeping bag pad.

The Strategic Conflict mission area relates to inter-continental or transoceanic inter-theater conflict. The US Army Strategic Defense program is the Army's only strategic weapons development program.

STRATEGIC CONFLICT

SDS MILESTONE 1



BSTS
BOOST SURVEILLANCE
AND TRACKING SYSTEM

EXOATMOSPHERIC

MIDCOURSE PHASE

SSTS
SPACE-BASED
SURVEILLANCE AND
TRACKING SYSTEM

POST-BOOST PHASE

SBI
SPACE-BASED
INTERCEPTOR

GSTS
GROUND-BASED
SURVEILLANCE TRACKING
SYSTEM

TERMINAL PHASE

ERIS
EXOATMOSPHERIC
REENTRY VEHICLE
INTERCEPTOR, SUBSYSTEM

BOOST PHASE

GBR
GROUND BASE RADAR

BM/C^3
BATTLE MANAGEMENT/
COMMAND AND CONTROL
AND COMMUNICATION

US Army Strategic Defense Command

MISSION:

The US Army Strategic Defense Command (USASDC) conducts the Army's only strategic weapons research and development program and is a major contributor to the Department of Defense Strategic Defense Initiative (SDI). The mission of the command is to conduct a coordinated research program, in coordination with Defense, SDI and Army guidance, to insure a timely, cost effective development of technologies for defense against ballistic missiles. Explicitly included in this mission is the development of Tactical Missile Defense technologies and management of Kwajalein Atoll as a National Missile Range.

PROGRAM STATUS:

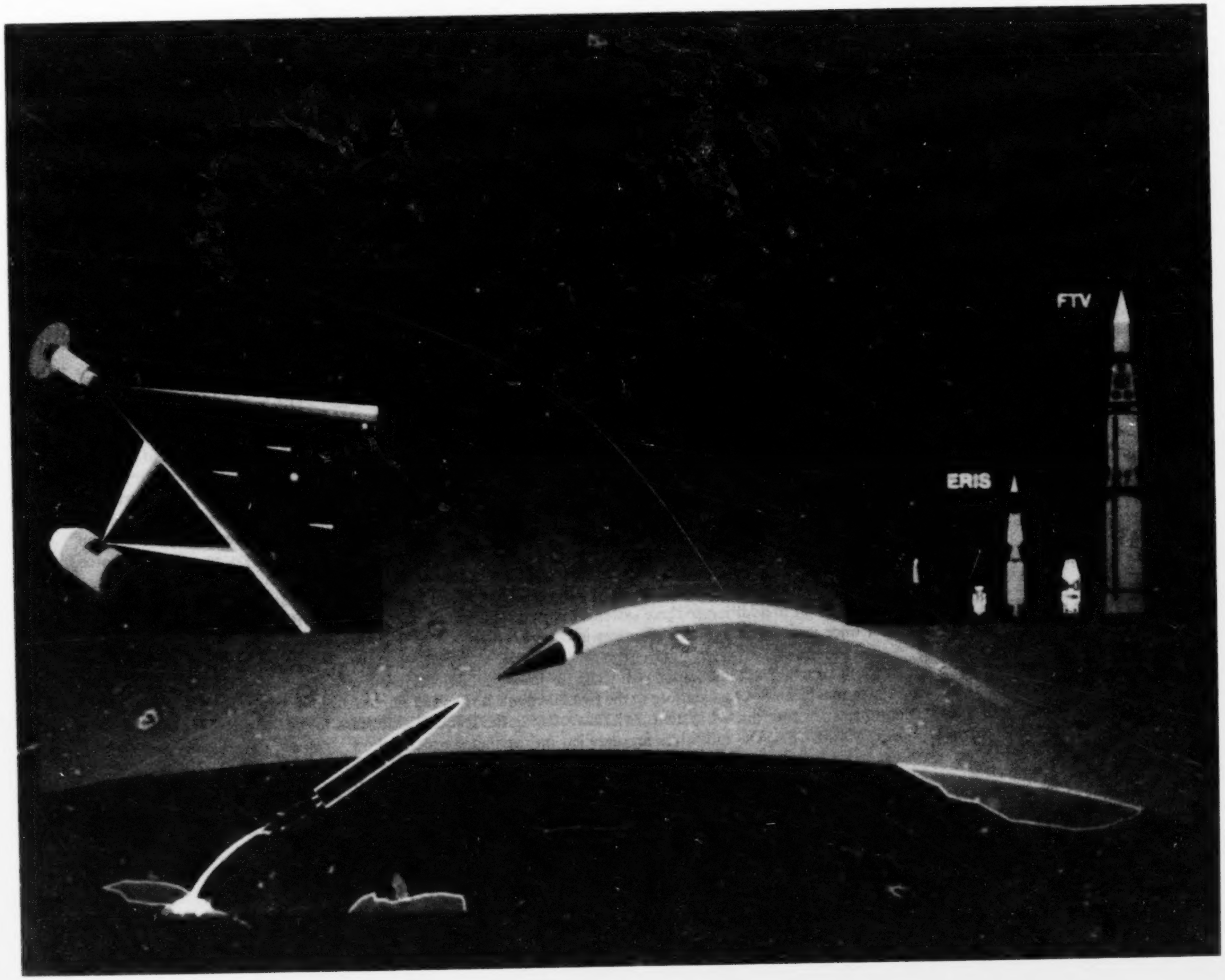
In FY 89 USASDC is managing a research program in excess of $1.3 Billion in the five functional areas of ballistic missile defense: Surveillance, Acquisition, Tracking, and Kill Assessment (SATKA); Kinetic Energy Weapons (KEW); Directed Energy Weapons (DEW); Systems Analysis/Battle Management (SABM); and Survivability, Lethality and Key Technologies (SLKT). This research focuses on demonstrating the technologies which will allow for the deployment of a multitiered Strategic Defense System (SDS). Also included in this funding are efforts in coordination with our allies for the development of the architectures, system technologies, and testbeds required for an effective theater missile defense.

In September 1987 and October 1988 the Defense Acquisition Board completed a review of the SDS and directed that Phase I of the program proceed from concept validation into demonstration and validation. Component systems in the follow-on phases will continue to undergo basic technological research. The schematic drawing depicts the major elements of Phase I of the SDS system. Army components include: the Exoatmospheric Reentry-Vehicles Interceptor Subsystem (ERIS), the Ground-based Surveillance and Tracking System (GSTS), and the Battle Management, Command, Control and Communications (BM/C3) support for these systems. The Air Force has developmental responsibility for the remaining Phase I systems: the Boost Surveillance and Tracking System (BSTS), the Space Based Interceptor (SBI), and the Space-Based Surveillance and Tracking System (SSTS). It is envisioned that in addition to these systems the Army's Ground Based Radar (GBR) will be incorporated into Phase I once its environmental assessment is complete.

In FY90 the program will build upon past technological developments through focused investigations, experiments, and functional technology validations in the five functional areas. The emphasis will be to demonstrate and validate technologies for the Phase I systems, while sustaining the technological base for the systems in the follow-on phases. Major USASDC initiatives are detailed on the pages which follow.

SOVIET COUNTERPART:

The Soviets are maintaining and upgrading the world's only operational Ballistic Missile Defense System around Moscow, and in addition are conducting a very active research and development program in more advanced BMD technologies.


FTV
ERIS

Exoatmospheric Reentry-Vehicle Interceptor Subsystem (ERIS)

MISSION:

ERIS is designed to conduct non-nuclear intercepts of reentry vehicles dispersed from Intercontinental Ballistic Missiles (ICBM) and Submarine-Launched Ballistic Missiles (SLBM). Midcourse sensors will acquire, track and pass target information to the battle manager element which will discriminate (determine which objects are reentry vehicles), assign ERIS interceptors to targets, provide trajectory and launch data to the interceptor, and communicate target state vector upgrades to the interceptors in-flight.

CHARACTERISTICS:

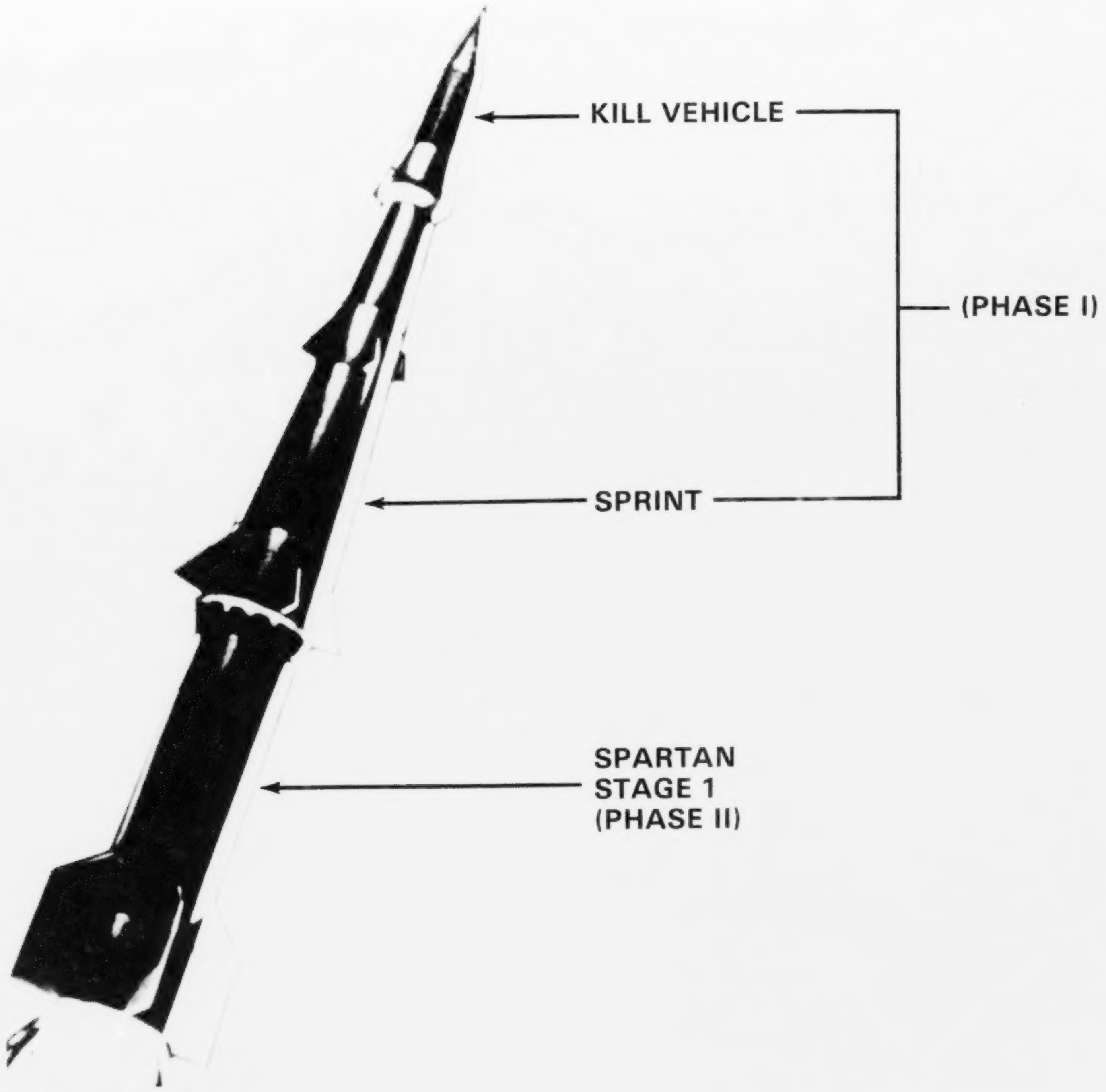
The ERIS is a lightweight system weighing approximately 700 kg. It is designed to provide a low cost per RV kill, estimated to be less than $1 million. The ERIS kill mechanism will be non-nuclear, using a lethality enhancing impulse kill technology. ERIS will employ the dormant missile concept, which will allow it to remain in an operationally ready condition in a sealed container without routine maintenance requirements.

PROGRAM STATUS:

All of the basic interceptor functions will be validated in a series of three Functional Technology Validation (FTV) tests taking place in FY90-91. Each test will address increasingly stressing threat levels. Once these basic functions are demonstrated, validated advanced technologies will be introduced in a proven testbed. The Advanced Technology Validation (ATV) tests will be conducted to introduce components based on new technologies such as: improved three-color staring seeker, cooled optics, fiber optics gyro, improved avionics, and reduced system size.

CONTRACTORS:

Lockheed (Prime) - (Sunnyvale, CA)
Texas Instruments (Seeker) - (Dallas, TX)
Honeywell (Avionics) - (Clearwater, FL)
Kearfott Navigation Controls Co (IMU) - (Little Falls, NJ)
TRW (Divert Propulsion) - (Redondo Beach, CA)
Hercules (Booster Propulsion) - (Magna, UT)
Rocket Research (Lethality Enhancement) - (Redmon, WA)


KILL VEHICLE
(PHASE I)
SPRINT
SPARTAN
STAGE 1
(PHASE II)

SPARTAN/SPRINT

High Endoatmospheric Defense Interceptor (HEDI)

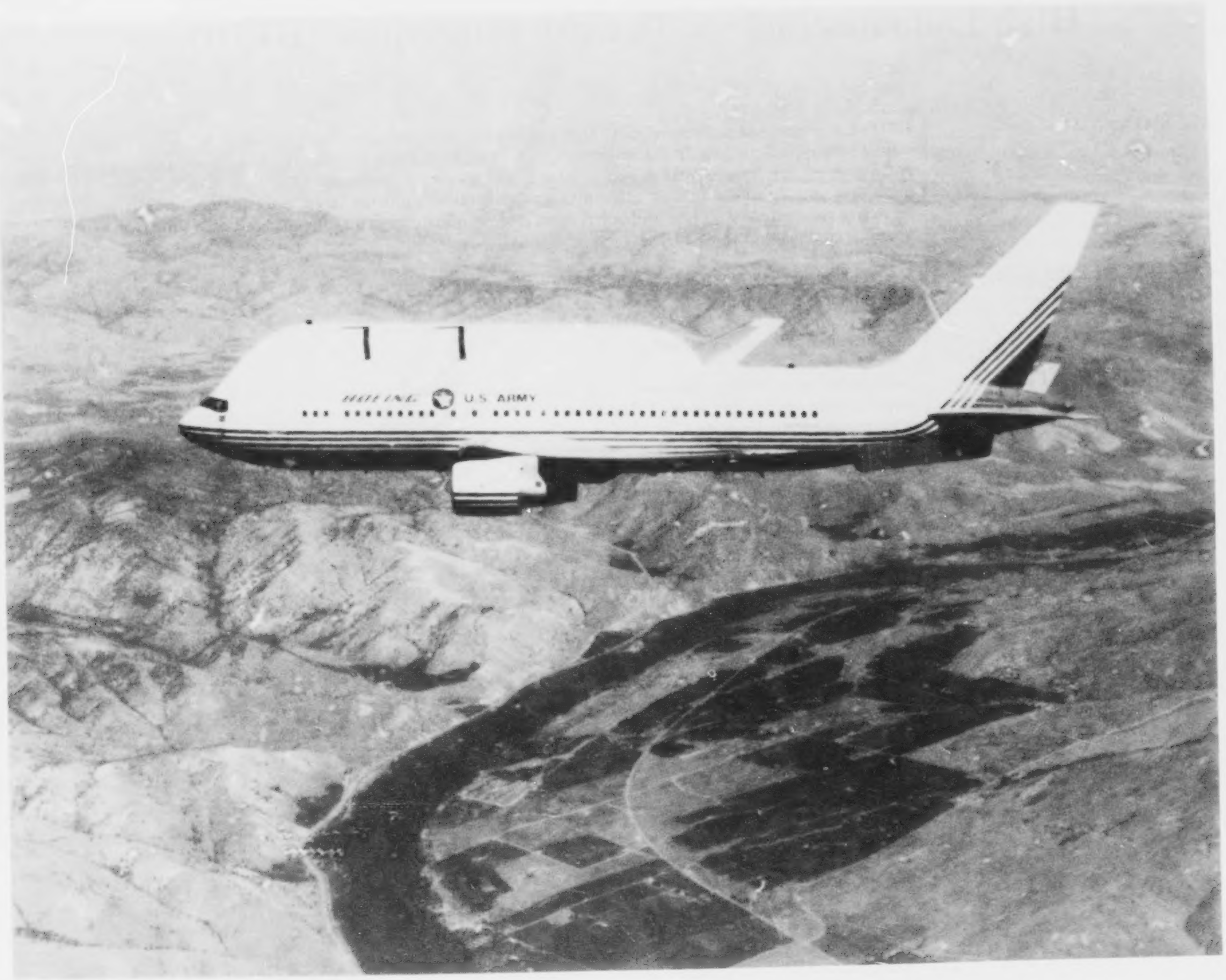
MISSION: HEDI is a ground-based, hypervelocity, high acceleration, area defense interceptor which will engage ballistic missile reentry vehicles high in the endoatmosphere. This battlespace requires HEDI to intercept short-range and depressed trajectory SLBMs as well as those ICBM RVs which penetrate the midcourse defense layer. The midcourse sensors and associated battle manager elements will provide target detection and discrimination, determine the desired target intercept point, select the appropriate trajectory for engaging each threat, and issue a launch command to the HEDI.

CHARACTERISTICS: The requirement for HEDI to function in the atmosphere at a high velocity requires it to be a lightweight interceptor with emphasis on propulsion and rapid divert capabilities. The vehicle and its individual components also must be able to withstand the high temperatures generated by atmospheric friction. A laser rangefinder will fuze a non-nuclear fragmenting warhead.

PROGRAM STATUS: Test results have verified the basic technology for the window cooling concept and the warhead shape, fragmentation pattern, and velocity. The Kinetic Kill Vehicle Integrated Technology Experiment (KITE) program is an ongoing study program structured to resolve critical issues using existing and developing technologies. In FY89, the kill vehicle will be integrated into the interceptor and tested in a launch at White Sands Missile Range, NM. Another KITE test will occur with the completion of the seeker and laser rangefinder. These flight tests will be followed by intercepts of strategic targets at the US Army Kwajalein Atoll.

CONTRACTORS:

McDonnell Douglas (Prime) - (Los Angeles, CA)
Hughes (Seeker) - (El Segundo, CA)
Aerojet (Controls) - (Sacramento, CA)


BOEING
U.S. ARMY

Airborne Optical Adjunct (AOA)

MISSION:

The Airborne Optical Adjunct (AOA) project is an ABM (Anti-Ballistic Missile) Treaty compliant technology experiment to determine how airborne optical sensors can best provide early warning and tracking of enemy ballistic missile warheads. The system holds the promise of being able to detect a wide range of objects during their flight outside the atmosphere and, as these objects generate heat on reentering the atmosphere, to discriminate warheads from decoys, debris, and chaff which may reenter with them. As such, the AOA supports sensor technology for the boost, midcourse and terminal phases of ballistic missile defense. It also provides for functional validation of the performance of airborne platforms for real-time, onboard processing of integrated sensor components.

CHARACTERISTICS:

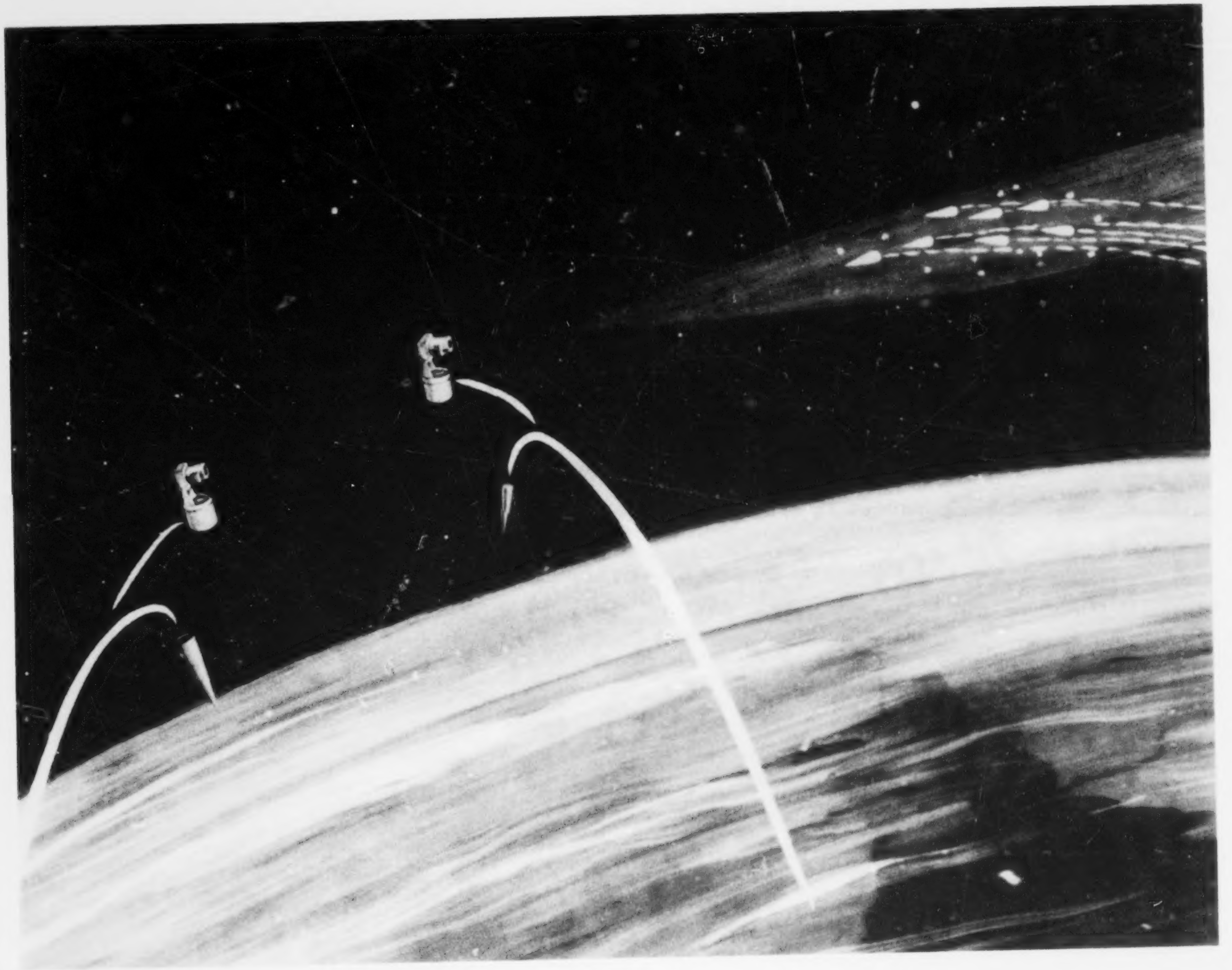
The system consists of a sophisticated Long Wave Infrared (LWIR) sensor and data processor installed in a modified Boeing 767 commercial jet aircraft. The key to AOA performance is ability of the LWIR sensor system to detect the heat of objects against the cold space background within its field of view. The aircraft will be used to test LWIR and data processing performance and as a testbed vehicle for other sensors and SDI systems.

PROGRAM STATUS:

Modifications to the AOA aircraft have been completed to permit installation of the sensor subsystem and airworthiness tests. The sensor subsystem has been completed and is now undergoing systems integration testing. In addition, detection and operating algorithms continue to be developed for the sensor and data processing system. The AOA system will be used in a series of experimental flights designed to validate the functional performance of an LWIR sensor on an airborne platform in detecting and tracking ICBM reentry vehicles, and discriminating warheads from other objects. Beginning in 1989 AOA flights will validate and test onboard computer and other electronic equipment necessary for analog and digital processing of data. Test flights are to be initiated in CONUS while operational flights will be conducted at the US Army Kwajalein Atoll missile range.

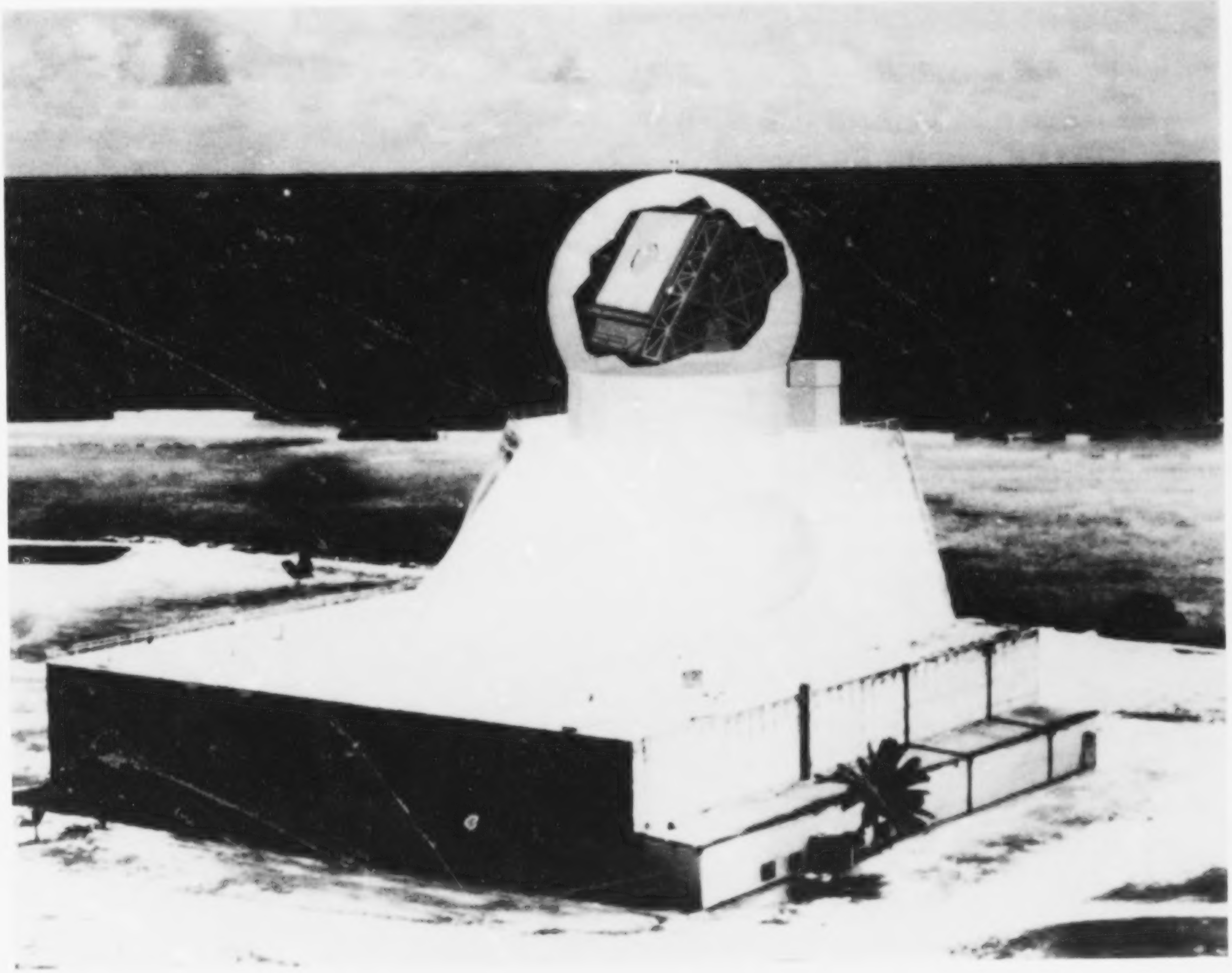
CONTRACTORS:

Boeing (Prime) - (Kent, WA)
Hughes (Sensors) - (Clearwater, FL)
Honeywell (Data Processing) - (El Segundo, CA)



Ground-Based Radar (GBR)

MISSION:	The Ground-Based Radar Experiment (GBR-X) is an experimental prototype ground-based radar which will perform object discrimination in both the midcourse and high endoatmospheric flight regimes. It will demonstrate and validate midcourse defense operations, provide an instrumentation sensor for interceptor testing, and provide a high power agile phased-array instrumentation radar at the US Army Kwajalein Atoll.
CHARACTERISTICS:	GBR is a high power, single-face, dual-use, phased-array radar. The full field and limited field-of-view antennas each contain over 21,000 elements used for steering the antenna beam. The antenna itself is a 100-meter structure. Standard traveling wave tubes will form the heart of the transmitter power group. The radar will depend heavily on new software development to control all aspects of the system and perform the crucial acquisition, tracking, and discrimination functions.
PROGRAM STATUS:	The Ground-Based Radar Experiment (GBR-X) will be an SDI Phase I technology validation experiment which will form the basis for an operational GBR. A 48-month development contract has been awarded and the GBR-X will be operational in 1993 at USAKA. A number of significant studies relating to GBR-X utilization and capabilities have been performed. The analyses have validated the design concepts incorporated into GBR-X and form a basis for developing detailed algorithms and operational procedures.
CONTRACTORS:	Raytheon (Prime) - (Boston, MA) TRW (Software) - (Redondo Beach, CA) Control Data (Data Processing) - (Redondo Beach, CA)



Ground Based Laser (GBL)

MISSION:

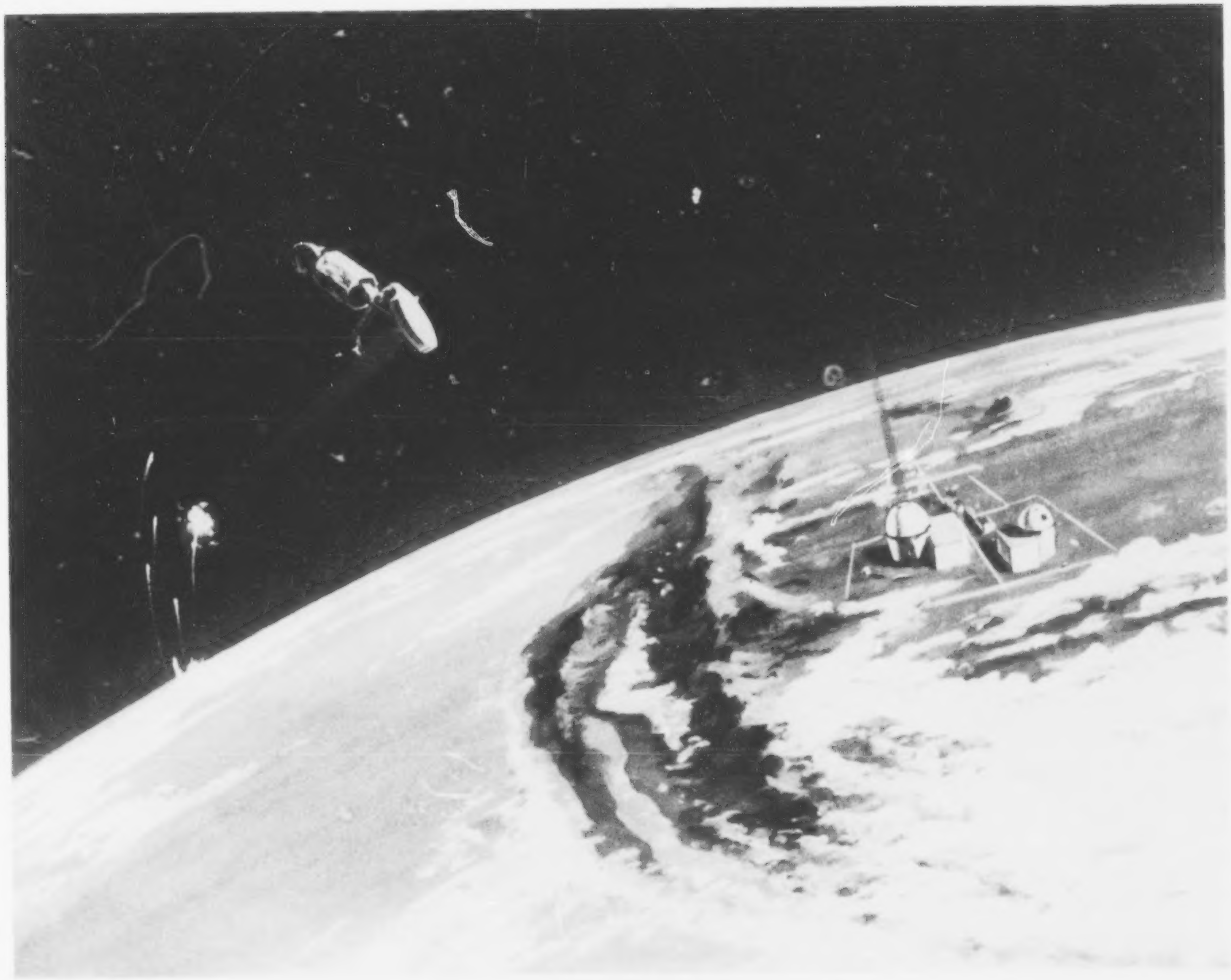
The GBL program will involve a series of laser experiments at White Sands Missile Range, NM. These experiments will provide technology which could eventually contribute to the development of a laser system capable of destroying incoming enemy missiles and warheads. As shown in the diagram at left, a powerful laser would be fired from the ground, reflected first off a high altitude relay mirror in orbit, then reflected off a "fighting mirror," from which it could hit target hostile missiles in many positions. An important aspect of this system is that it could destroy enemy missiles during their boost phase, just after launch, when they are most vulnerable. The test program will show that lasers of multi megawatt power can be built, that a laser beam can be directed to and its energy deposited on a space based target, and that the components of an operational system can be integrated. This will provide the basis for scaling to a larger operational system in the future. The GBL experiment will be conducted using either an induction linac laser (linear accelerator) or a RF (radio frequency) linac laser depending on which device provides the best laboratory results.

PROGRAM STATUS:

The free electron laser (FEL) technology which powers the GBL has experienced rapid gains in the last several years. In experiments at Lawrence Livermore National Laboratory, the induction linac FEL has been demonstrated to operate with high efficiency at long wavelengths. In experiments at Los Alamos National Laboratory, work on RF linac devices have demonstrated the ability to lase at extremely short wavelengths at high efficiency. Construction has begun on the facilities at White Sands Missile Range. Detailed design and acquisition for lasers and the beam control system will begin in FY89. Following a successful experiment, this ground segment technology will provide the basis for full-scale development of an operational system.

CONTRACTORS:

Boeing (RF FEL) - (Seattle, WA)
TRW (Induction FEL) - (Redondo, CA)
Lockhead (Beam Control) - (Sunnyvale, CA)
TRW (System Engineering) - (Redondo, CA)
Fluor (Facilities) - (Irvine, CA)



Ground-Based Surveillance and Tracking System (GSTS)

MISSION:

The GSTS will support tracking and discrimination in the midcourse phase of the battle space using sensors carried into space by a rocket booster. The operational concept calls for pairs of GSTS sensors, launched at appropriate times after receipt of attack warning from boost-phase sensors, to provide to the battle manager correlated data on reentry vehicles during the midcourse phase. This system will be used to augment performance of space-based sensors and to cover gaps created by antisatellite attacks or nuclear detonation.

CHARACTERISTICS:

GSTS will use a passive Long Wave Infrared (LWIR) sensor to perform discrimination and tracking. This system incorpates devices to provide high speed signal throughput and rapid onboard data processing.

PROGRAM STATUS:

A prototype GSTS is being developed to provide for technical validation experiments to support midcourse discrimination and tracking. The GSTS will be integrated with the Boost Surveillance and Tracking System (BSTS) and other midcourse sensors (the Space-Based Surveillance and Tracking System and the Ground-Based Radar) for a full end-to-end tracking and discrimination experiment. A validated GSTS system concept will complete demonstration and validation in the mid-1990s.

CONTRACTORS:

McDonnell Douglas (Prime) - (Huntington Beach, CA)
Hughes (Sensors) - (El Segundo, Ca)
Rockwell (Sensors) - (Anaheim, CA)
TRW (Software) - (Huntsville, AL)
Honeywell (Data Processor) - (Clearwater, FL)
SPARTA (Systems Engineering) - (Huntsville, AL)

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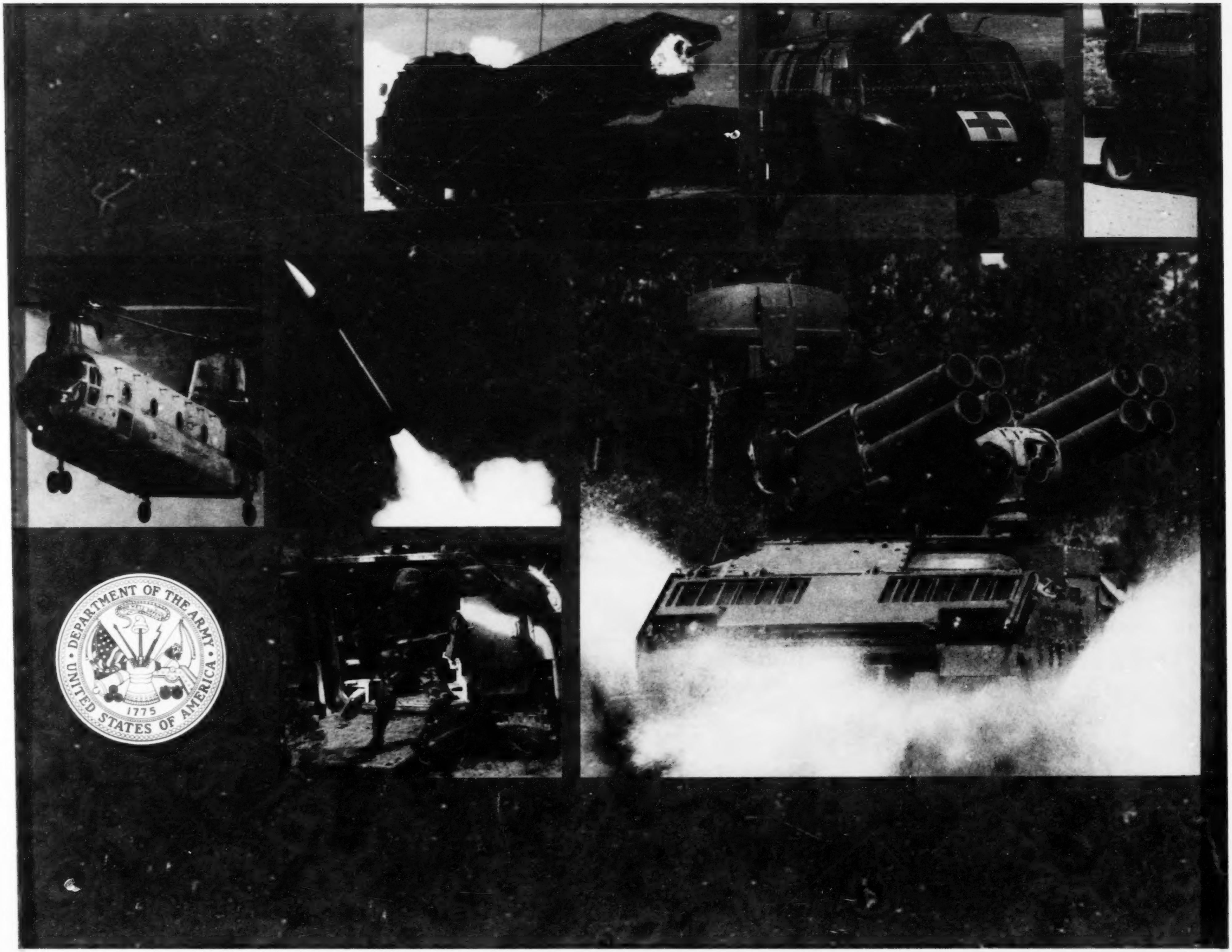
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